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OPERATION MANUAL FOR CO PROBE LASER FOR ATMOSPHERIC STUDIES,(U)
MAY 77 E K DAMON, M E THOMAS N00173-76-C-0233

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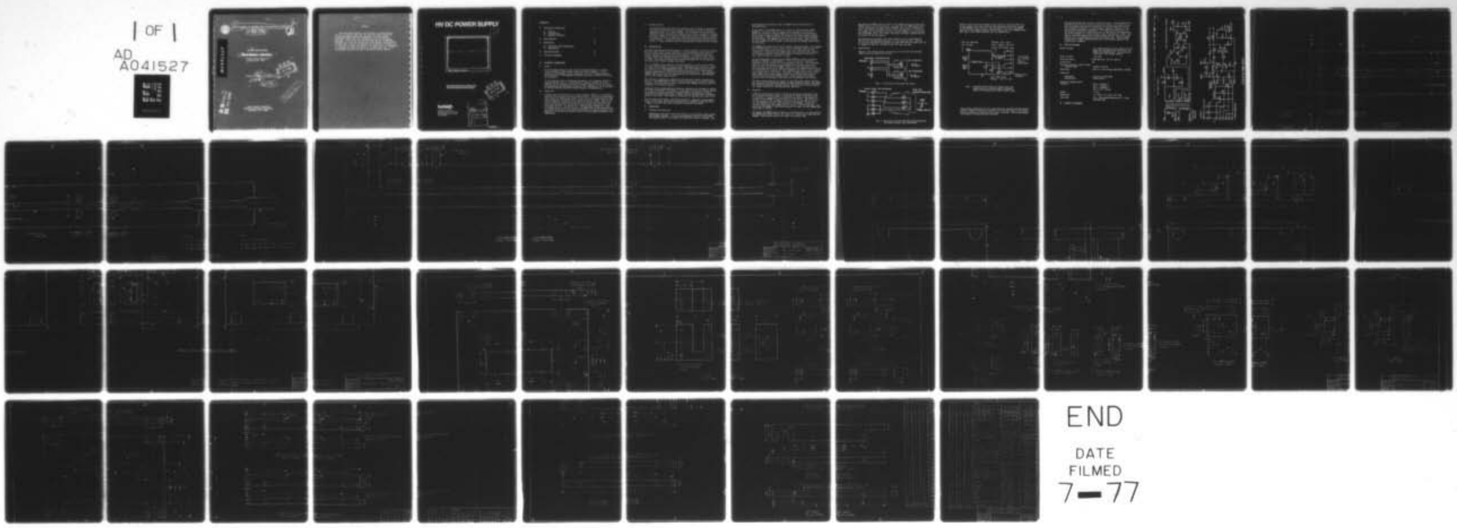

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OPERATION MANUAL FOR CO PROBE LASER FOR ATMOSPHERIC STUDIES,

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1 The Ohio State University

3 ElectroScience Laboratory

Department of Electrical Engineering
2 Columbus, Ohio 43212

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Contract No. N00173-76-C-0233

11 May 1977

12 48p.

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NOTICES

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HV DC POWER SUPPLY

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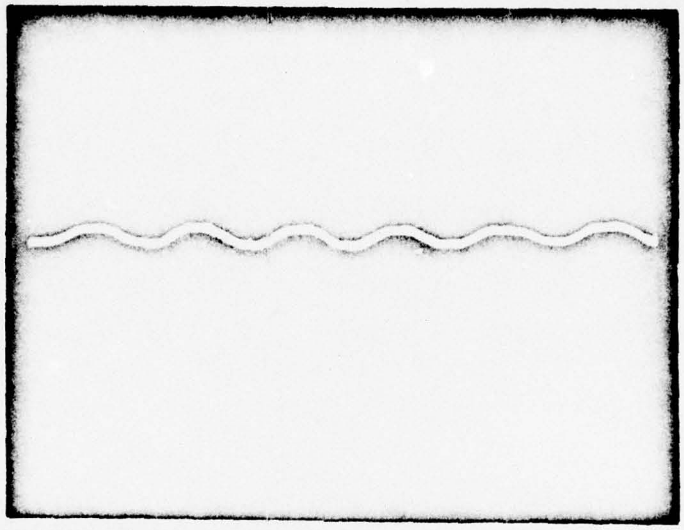

RIPPLE: 100 mv/div at 700 v dc

Tech Memo/Instruction Manual for PZ-62 Variable DC Power Supply

burleigh

Burleigh Instruments Inc.
100 Despatch Drive, PO Box 388
East Rochester, New York 14445
(716) 586-7930

No. EL 145 775

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1. INCOMING INSPECTION

A. Visual

The PZ-62 High Voltage DC Power Supply has been packaged in a special carton designed to give maximum protection during shipment. If the outside of the shipping carton is damaged, notify your shipping department immediately. The shipping department may wish to notify the carrier at this point.

If the shipping carton is undamaged externally, the instrument should be removed from the carton. If any damage is evident visually or if any rattling can be heard when the PZ-62 is shaken lightly, notify your shipping department and Burleigh Instruments, Inc. immediately. It is advisable to save the special carton for future storage or transportation.

B. Electrical

Assuming that the instrument is in good condition visually, a preliminary check of its electrical operation should be made. This can be accomplished quite simply by checking the output on any one of the three miniature high voltage Sealectro connectors with a digital voltmeter (DVM). Plug in the PZ-62, establish a ground from the DVM to the PZ-62, and carefully touch the center pin of one of the miniature high voltage connectors with the probe from the DVM. Be careful not to bend the high voltage pin. With the COMMON switch in the ON position, the COMMON knob can be increased and the output of any one of the connectors should go to several hundred volts. Should the PZ-62 fail this initial check, notify Burleigh Instruments, Inc. immediately.

C. Quality Control

It should be noted that the PZ-62 undergoes several stages of inspection, test, and calibration before shipment, including a burn-in at elevated temperatures for 5 to 7 days, minimum. The instrument has undergone an exhaustive final test and calibration process prior to shipment. Problems can occur, however, and should a problem arise during the warranty period, Burleigh's policy is to repair any instruments within ten days of receipt at the factory. During this period the instrument will be burned-in for a period of 3 days, minimum, before rechecking and returning to the customer.

2. DESCRIPTION

The PZ-62 High Voltage DC Power Supply is a high stability, low noise, variable DC power supply with 3 output channels. It is particularly well suited for driving Burleigh PZT devices such as PZT Pushers, PZT Aligner/Translators, Tunable Etalons and Fabry-Perots Interferometers. A convenient front panel voltage range switch permits selection of maximum operating voltages of 500v or 1000v. This feature ensures that excessive voltage will not be applied to PZT devices with limited voltage capability.

With the COMMON selector switch in the OFF position, the full output voltage in either voltage range can be controlled independently at each output connector using the 3 independent CHANNEL knobs. With the COMMON selector switch in the ON position, the COMMON knob adjusts the output of all three output channels synchronously over half the voltage range selected. The independent CHANNEL knobs can be used for adjustment on each channel over the remaining half of the voltage range selected.

This feature is particulary useful when driving three element piezoelectric devices. The COMMON knob is used for axial positioning of an optical element mounted in the piezoelectric device, and the three CHANNEL knobs are used for alignment of the optical element.

Individual high voltage miniature Sealectro connectors are provided to connect the PZ-62 to Burleigh's PZT Pushers. A multiple pin connector (Viking TKR-07) is provided to connect Burleigh's multiple element piezoelectric devices, including PZT Aligner/Translators, Tunable Etalons and Fabry-Perot Interferometers to the PZ-62. Both kinds of connectors are standard with every PZ-62.

The all solid state design, conservative choice of components, large double-sided circuit board, and careful construction all combine to make the PZ-62 a rugged, versitile and easily serviceable laboratory instrument.

3. OPERATION

A. Controls and Connectors

Beginning at the left of the front panel is a two position rotary switch marked RANGE SELECTOR. In the counterclockwise position, marked 500v, the maximum output of any channel is 1000v with respect to ground. The

grey multiple pin connector under the RANGE slector switch will be discussed later.

To the right of the RANGE switch is a block of controls marked OUTPUT CONTROLS. At the far left of this block of controls are two rotary knobs; the top knob is marked COMMON, the bottom knob is marked OFF/ON. The top knob is used to adjust the voltage to all three output channels synchronously. When the OFF/ON rotary switch is in the counterclockwise or OFF position, the COMMON control knob is inoperative. With the OFF/ON rotary switch in the clockwise or ON position, the COMMON control knob is functional.

The COMMON knob controls half of the output voltage available. For example, if the RANGE switch is set at 1000v, and the individual controls are set such that the outputs on channels 1, 2 and 3 are 100v, 200v and 500v respectively, then turning the COMMON knob fully clockwise will increase the voltage on channel 1 from 100v to 600v, on channel 2 from 200v to 700v, and on channel 3 from 500v to 1000v.

The remaining three controls in the OUTPUS CONTROLS section are marked CHANNEL 1, CHANNEL 2, and CHANNEL 3. These are used for individual adjustments of the voltage on the three output channels. With the RANGE switch in the 500v position and the COMMON selector switch in the ON position, each of the three CHANNEL knobs has a 250v adjustment range. With the RANGE switch in the 1000v position and the COMMON selector switch in the OFF position, each of the three CHANNEL knobs can be used to adjust each channel over a full 1000v. The output voltages appear on the three gold, subminiature, high voltage, Sealectro connectors found directly beneath each of the three CHANNEL knobs. These connectors interface directly with the Sealectro connectors used on Burleigh's PZT Pushers.

The three output channels also appear on the Viking grey plastic multiple pin connector found directly beneath the RANGE selector switch. Burleigh's PZT Aligner/Translators, Tunable Etalons, and Fabry-Perot Interferometers all connect directly to this multiple pin connector.

B. Operation

A DVM can conveniently be used to check the electrical operation of the PZ-62 Variable DC Power Supply. The ground or common of the DVM should be connected to the ground of the PZ-62 and the probe of DVM should be touched to the CHANNEL 1 output connector of the PZ-62. (Be careful not to bend the pin). Set the RANGE selector switch in the 500v position, set the COMMON knob fully counterclockwise, the CHANNEL 1 knob fully counterclockwise and the COMMON selector switch to the OFF position. Now adjusting the CHANNEL 1 knob should produce 0 to 500v, and the COMMON knob should have no effect.

Now switch the COMMON selector switch to the ON position. In this position the COMMON knob should control the output over another 250v range and the CHANNEL 1 knob should control the output over another 250v.

Now switch the RANGE selector switch to the 1000v position and leave the COMMON selector in the ON position. In this mode the COMMON knob should provide adjustment over 500v and the CHANNEL 1 knob over an additional 500v. Now return the COMMON selector to the OFF position. In this mode the COMMON knob should have no control and the CHANNEL 1 knob should provide adjustment over a full 1000v. The other two output channels should be checked in the same manner.

Now looking at any channel, the output should be set at approximately 500v and the DVM should be switched to an AC measuring mode. Check to be sure that the DVM when operated in a high sensitivity AC model will not be damaged by 500v DC. The DVM should read about 5mv RMS.

C. Applications

Figures 1 and 2 below depict the operation of the PZ-62 with Burleigh single and multi-element PZT devices.

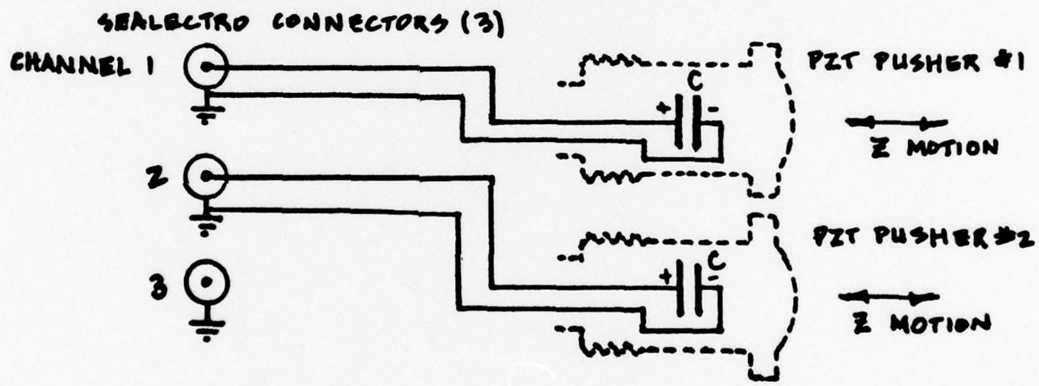


Fig. 1 PZ-62 with two Burleigh PZT Pushers

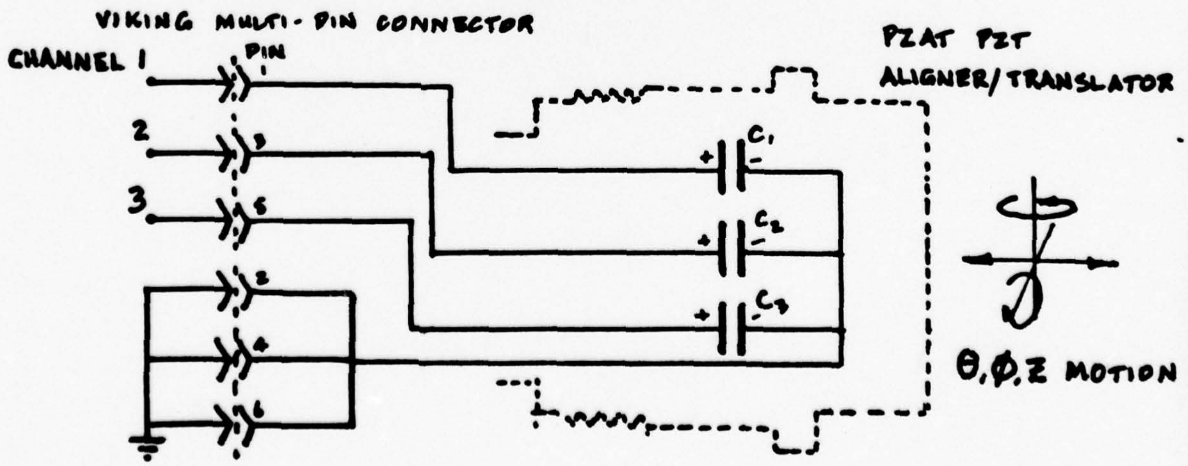


Fig. 2 PZ-62 with Burleigh PZAT PZT Aligner/Translator
(TL Tunable Etalon or RC Fabry-Perot)

Figure 3 also shows an alternate wiring scheme for the PZ-62 which can be used either to provide the full 1000v adjustment capability on each of the CHANNEL knobs, plus have 500v adjustment control on the COMMON knob (or in the opposite mode to provide 500v on the three CHANNEL knobs plus have a full 1000v available from the COMMON knob).

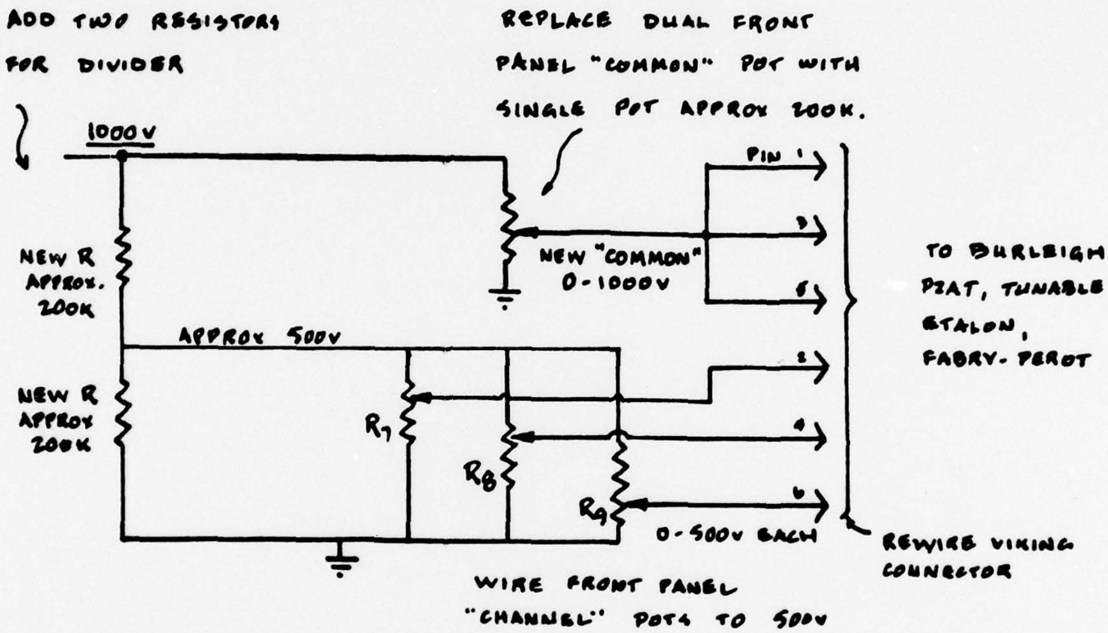


Fig. 3 Alternate PZ-62 wiring for maximum axial and angular adjust on Burleigh PZAT, TL Tunable Etalon or RC Fabry-Perot. DONE AT USER'S RISK.

These wiring connections are only appropriate for operation with Burleigh's multiple element piezoelectric devices, for which all inputs to the piezoelectric elements are floating with respect to ground. The wiring changes can be made to the multiple pin connector.

Such wiring changes must be done at the user's risk. This information is provided since there are certain instances in which it is useful to combine the maximum translational capability of the piezoelectric devices with alignment capability, or where maximum alignment capability is required with translational adjustment. The instruction manuals for the PZT Aligner/Translators, Tunable Etalons, or Fabry-Perot Interferometers should be consulted for proper wiring of the piezoelectrics. NOTE: care must be taken when making such a wiring change that the reverse voltage applied to the piezoelectric elements does exceed 500v. Thus whichever outputs have a +1000v capability must go to the positive inputs of the piezoelectric elements.

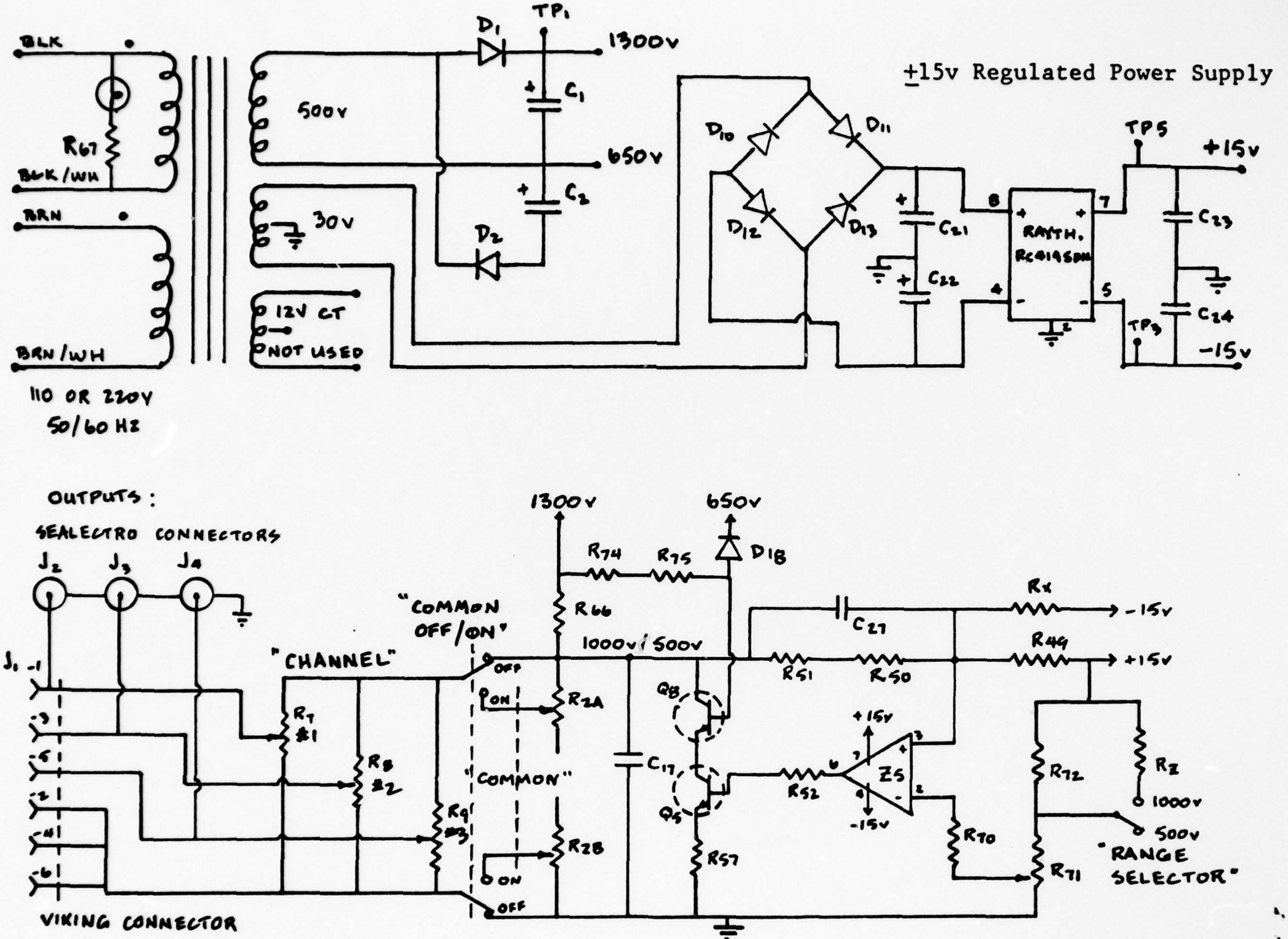
4. SPECIFICATIONS

Output Voltage	0 to 1000v depending on the position of the RANGE selector switch and position of the COMMON and CHANNEL knobs. See section 3B, "operation", for further details.
Output Current	.1mA, max.
Noise and Ripple	≦10mv RMS max.; 5mv p-p typical
Settability	≦2v
Long-Term Stability (after 30 min. settling time)	≦300mv DC typical
Regulation	≦.05% for line voltage 108-128VAC, 50/60Hz
Connectors	
Individual	Sealectro 51-045-0000
Multiple-pin	Viking TKR-07
Wiring for Viking output connector	Pin 1 - Channel 1 Pin 3 - Channel 2 Pin 5 - Channel 3 Pins 2,4,6 - Ground
Weight	12 lbs.
Dimensions	4.5" high x 15" wide x 11" deep
Line Cord	6 ft. with standard American U.L. 3-pin grounded plug

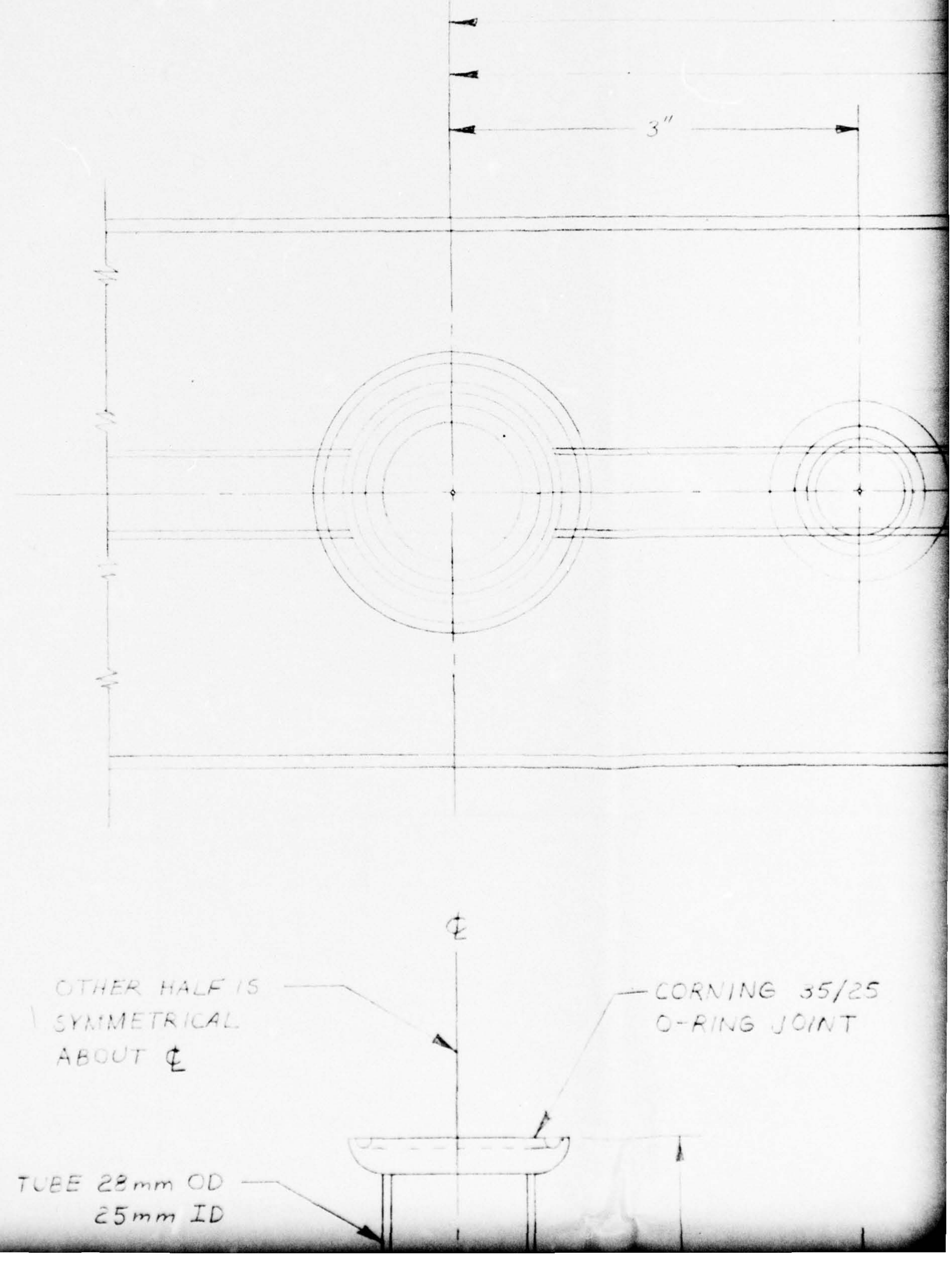
5. CIRCUIT DIAGRAMS

HV Power Supply

±15v Regulated Power Supply



PZ-62 HV DC POWER SUPPLY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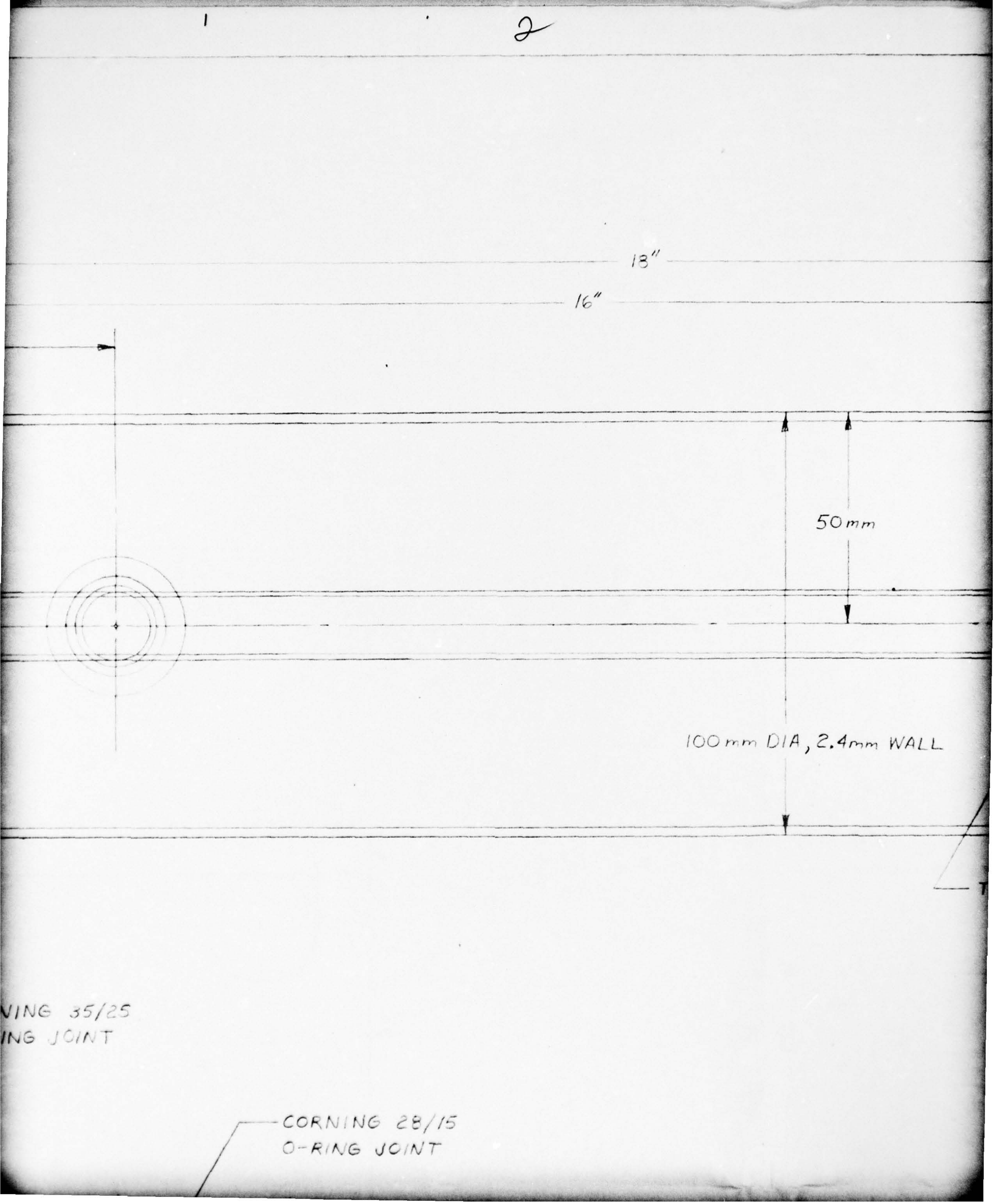
CORNING 35/25
O-RING JOINT
TUBE 28mm OD
25mm ID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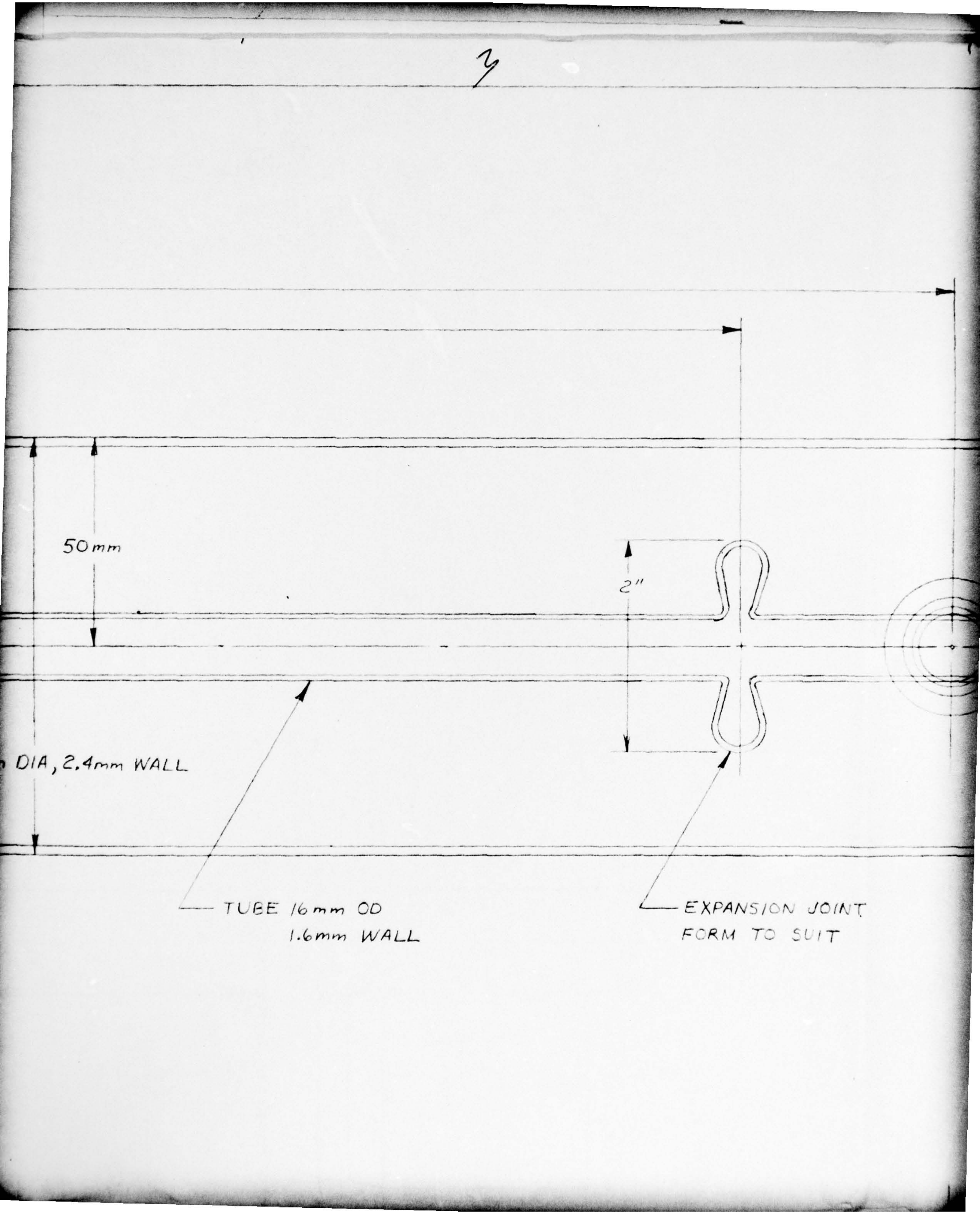
2
18"
16"
50mm
100mm DIA, 2.4mm WALL
NING 35/25
ING JOINT
CORNING 28/15
O-RING JOINT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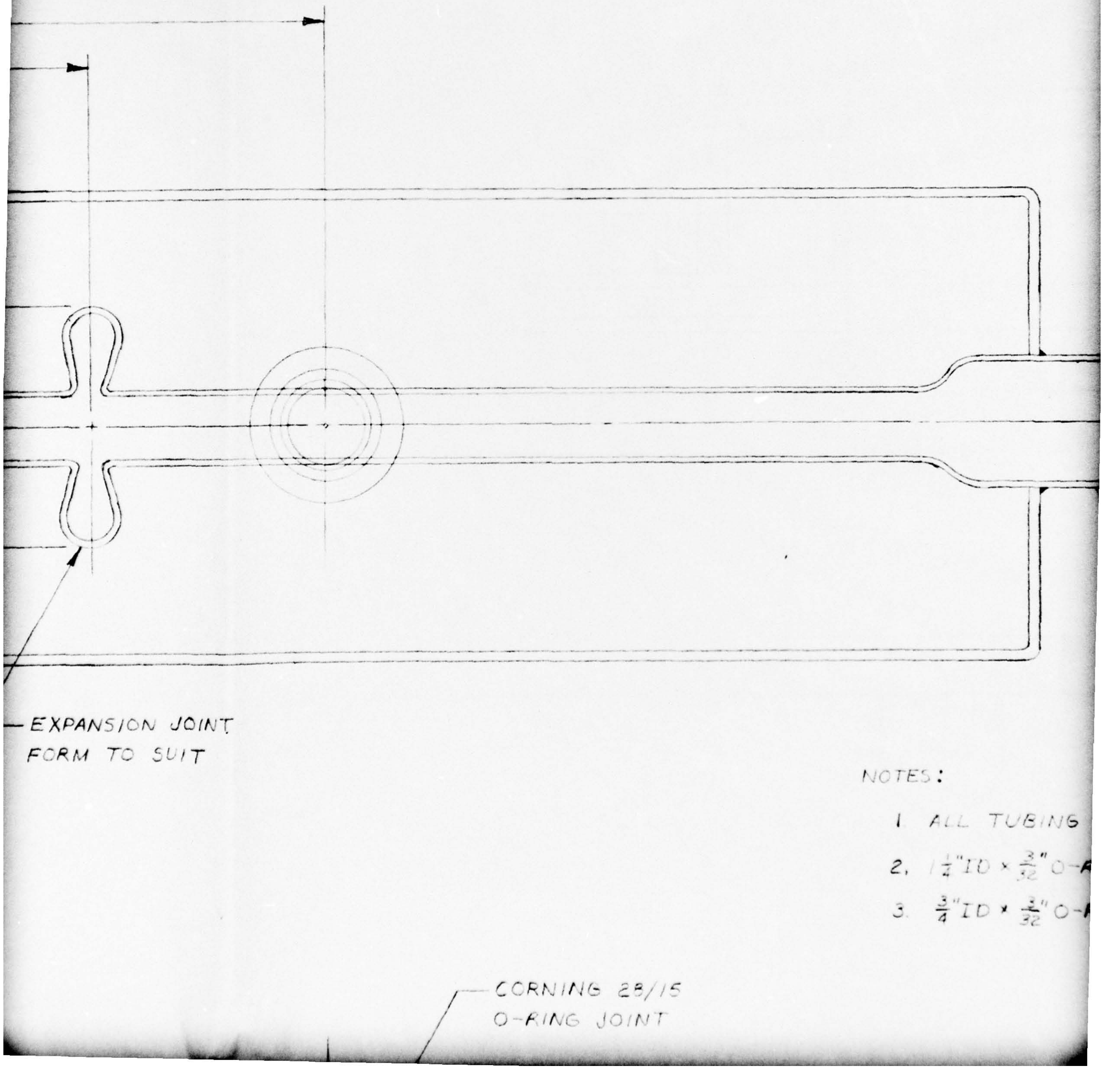
50mm
2"
DIA, 2.4mm WALL
TUBE 16mm OD
1.6mm WALL
EXPANSION JOINT
FORM TO SUIT



NOTES:

1. ALL TUBING

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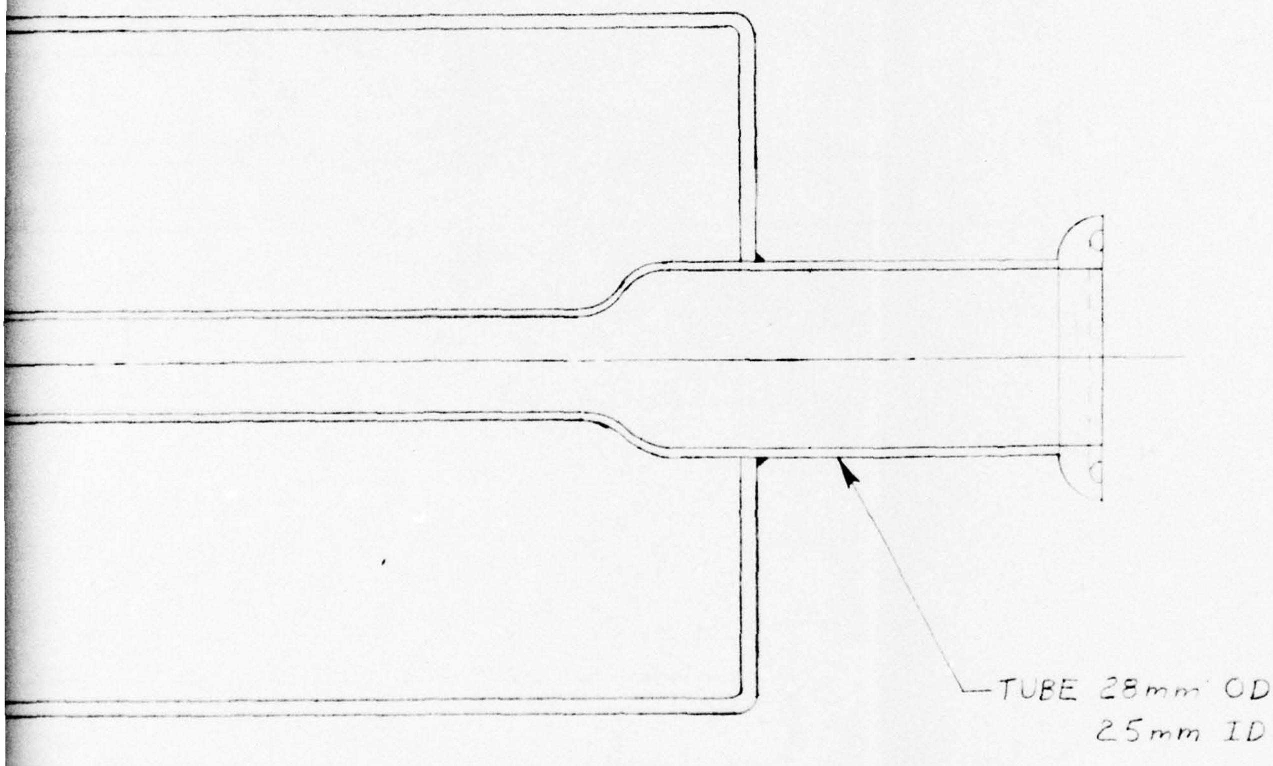
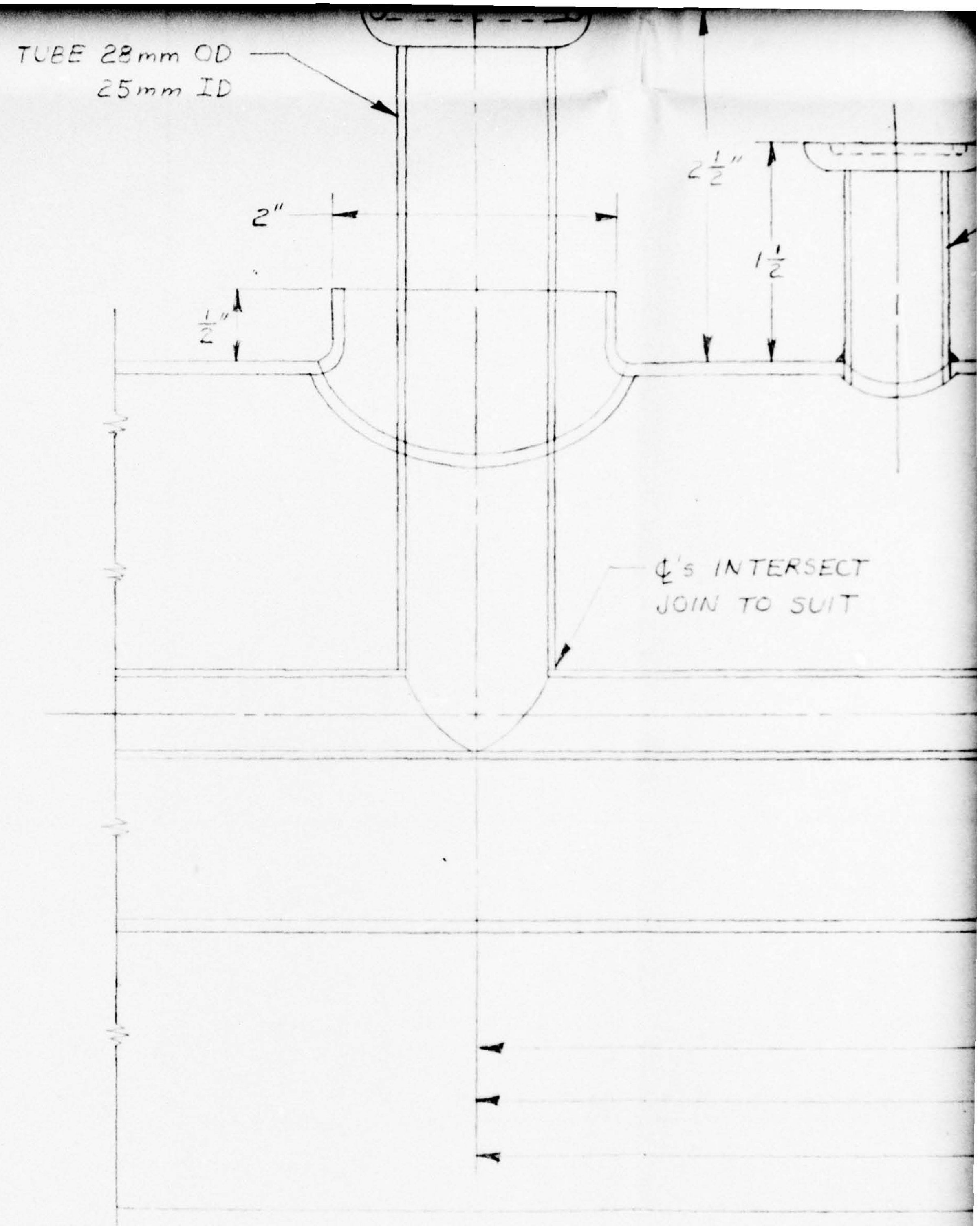
3. $\frac{3}{4}$"ID × $\frac{3}{32}$" O-R



NOTES:

1. ALL TUBING IS PYREX
2. $1\frac{1}{4}$" ID × $\frac{3}{32}$" O-RING FOR CORNING 35/25 JOINT
3. $\frac{3}{4}$" ID × $\frac{3}{32}$" O-RING FOR CORNING 28/15 JOINT

RNING 28/15
RING JOINT



TUBE 28mm OD
25mm ID
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$\frac{1}{2}$"
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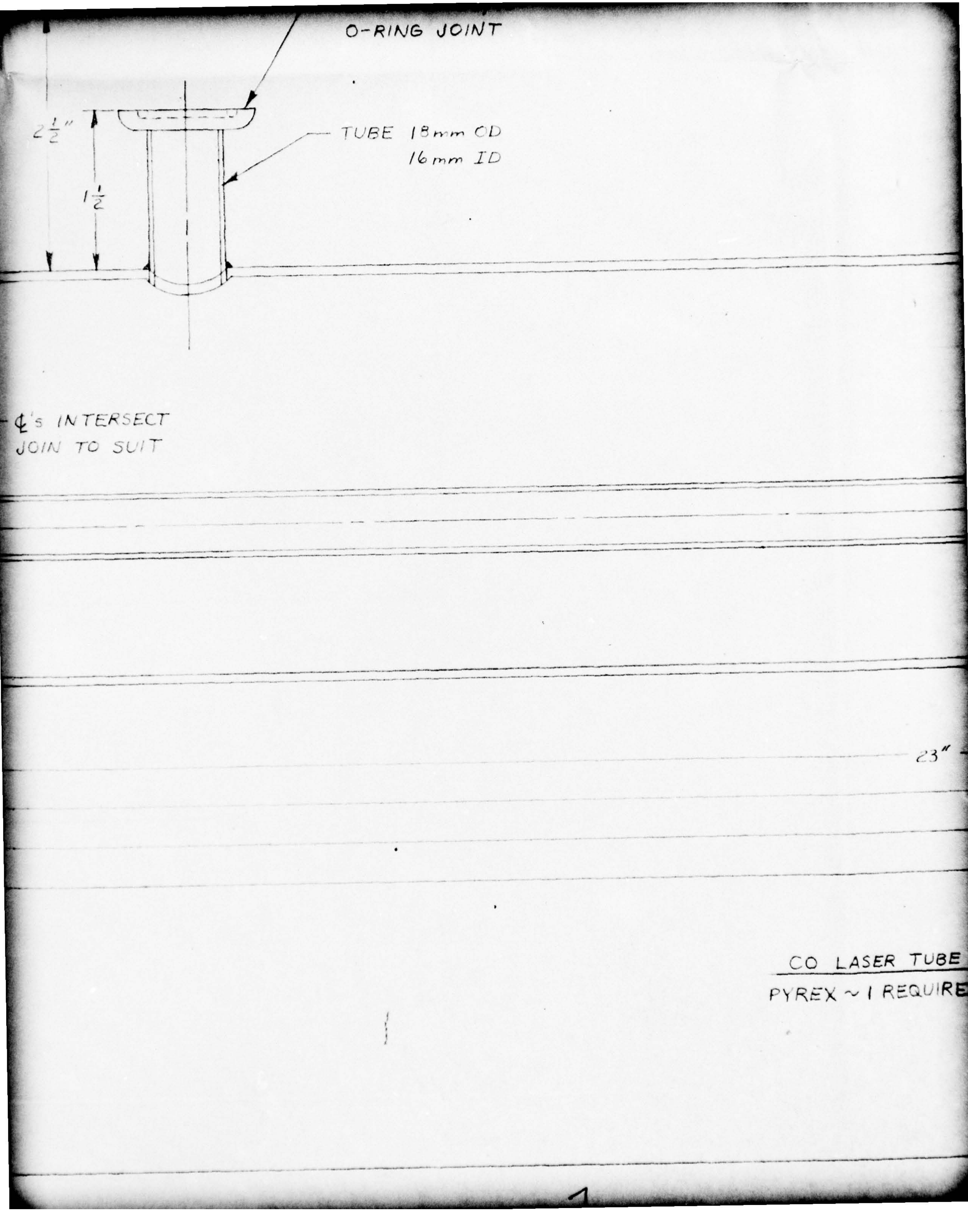
℄'s INTERSECT
JOIN TO SUIT

6



O-RING JOINT
TUBE 18mm OD
16mm ID
2 1/2"
1 1/2
₵'s INTERSECT
JOIN TO SUIT
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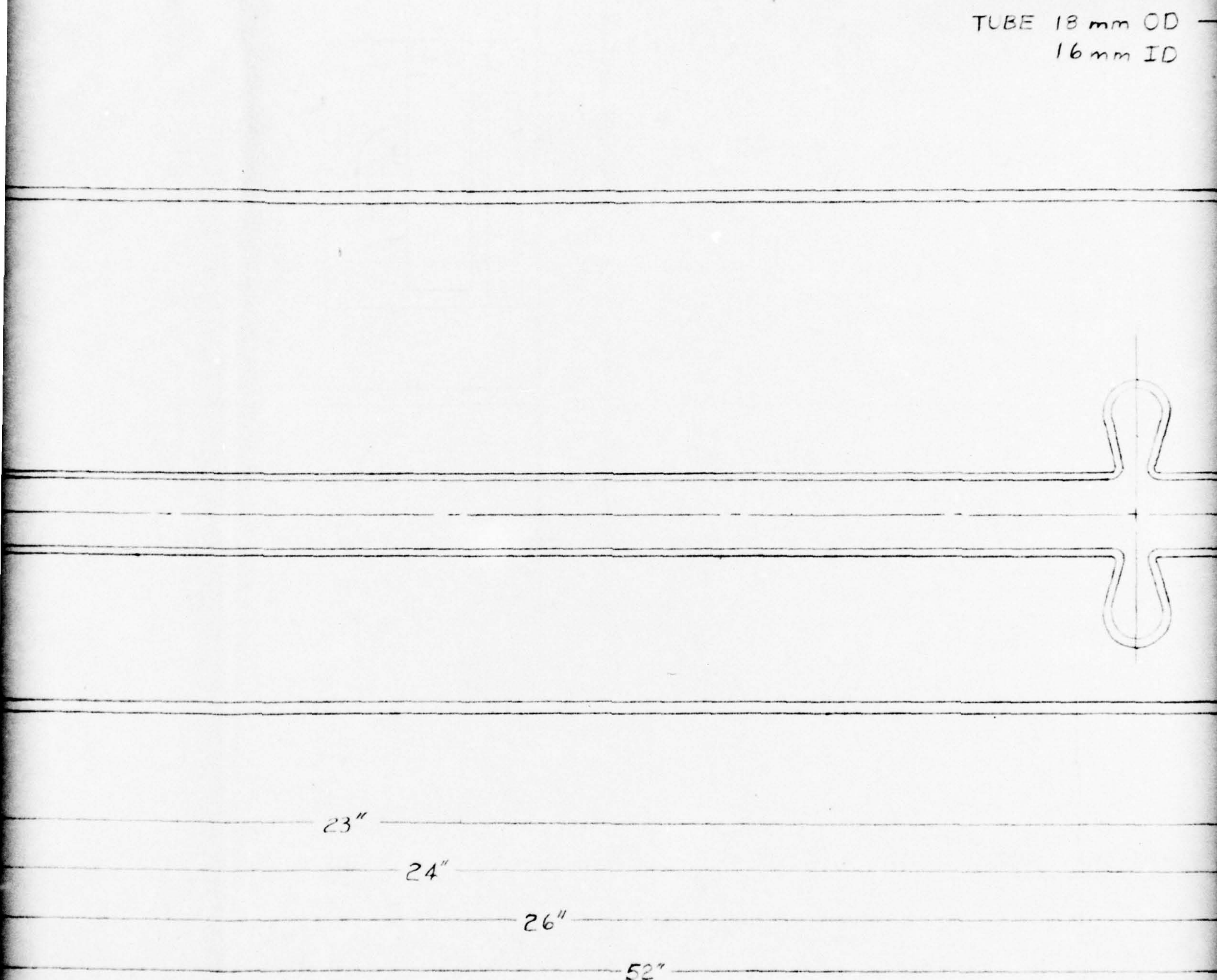
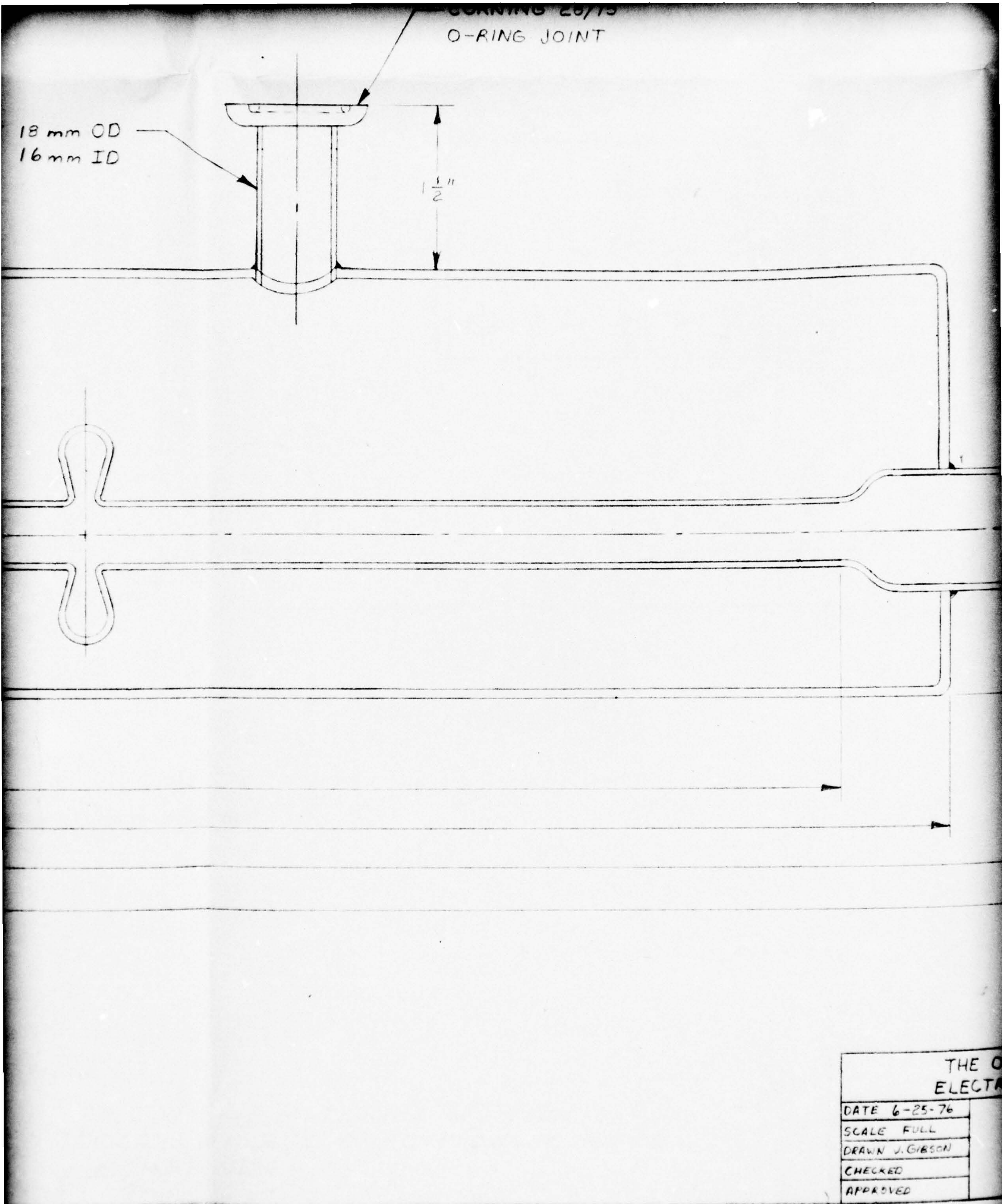
CO LASER TUBE
PYREX ~ 1 REQUIRE



CO LASER TUBE

PYREX ~ 1 REQUIRED


O-RING JOINT
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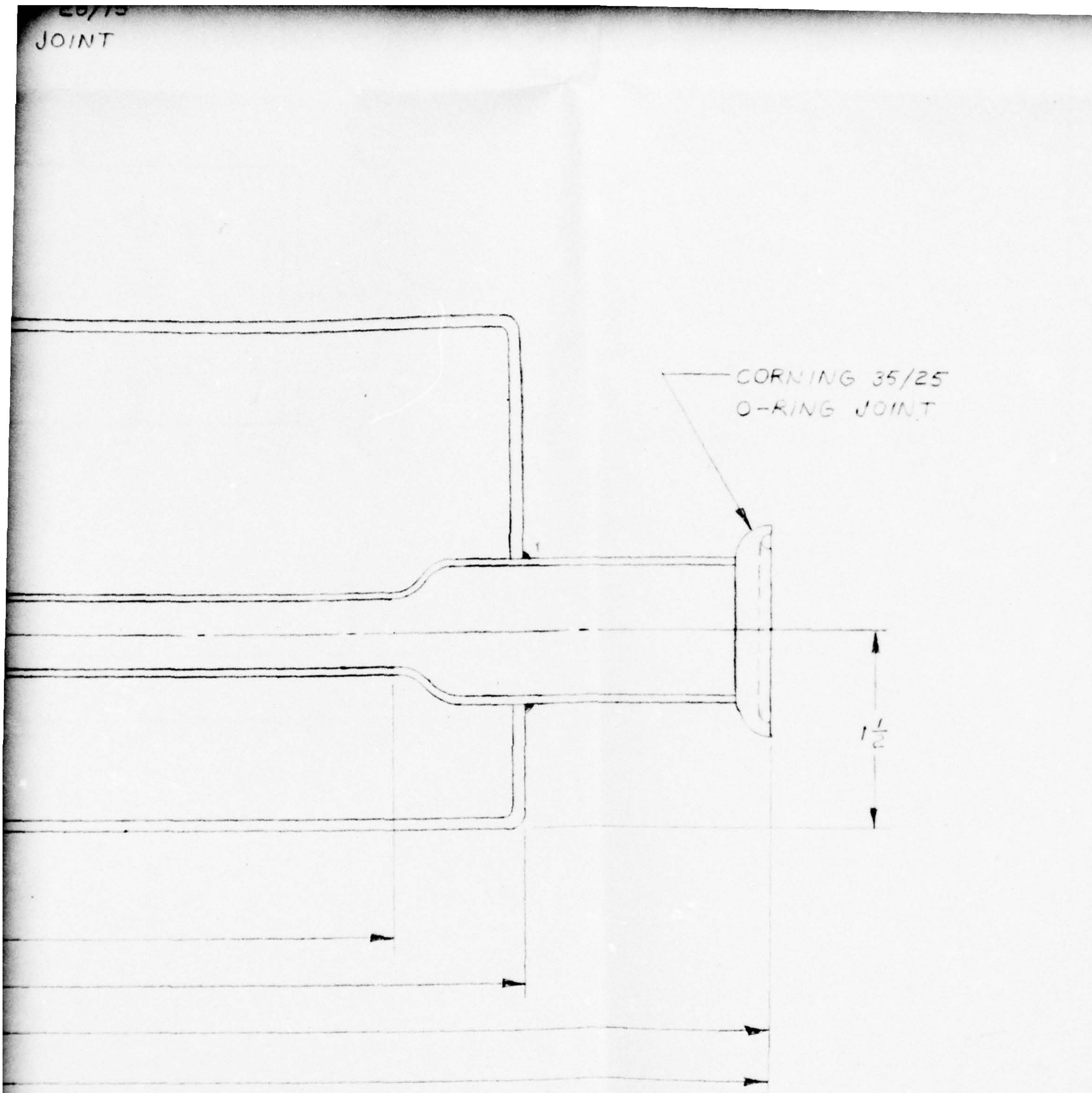

THE OHIO STATE UNIVERSITY
ELECTROSCIENCE LABORATORY

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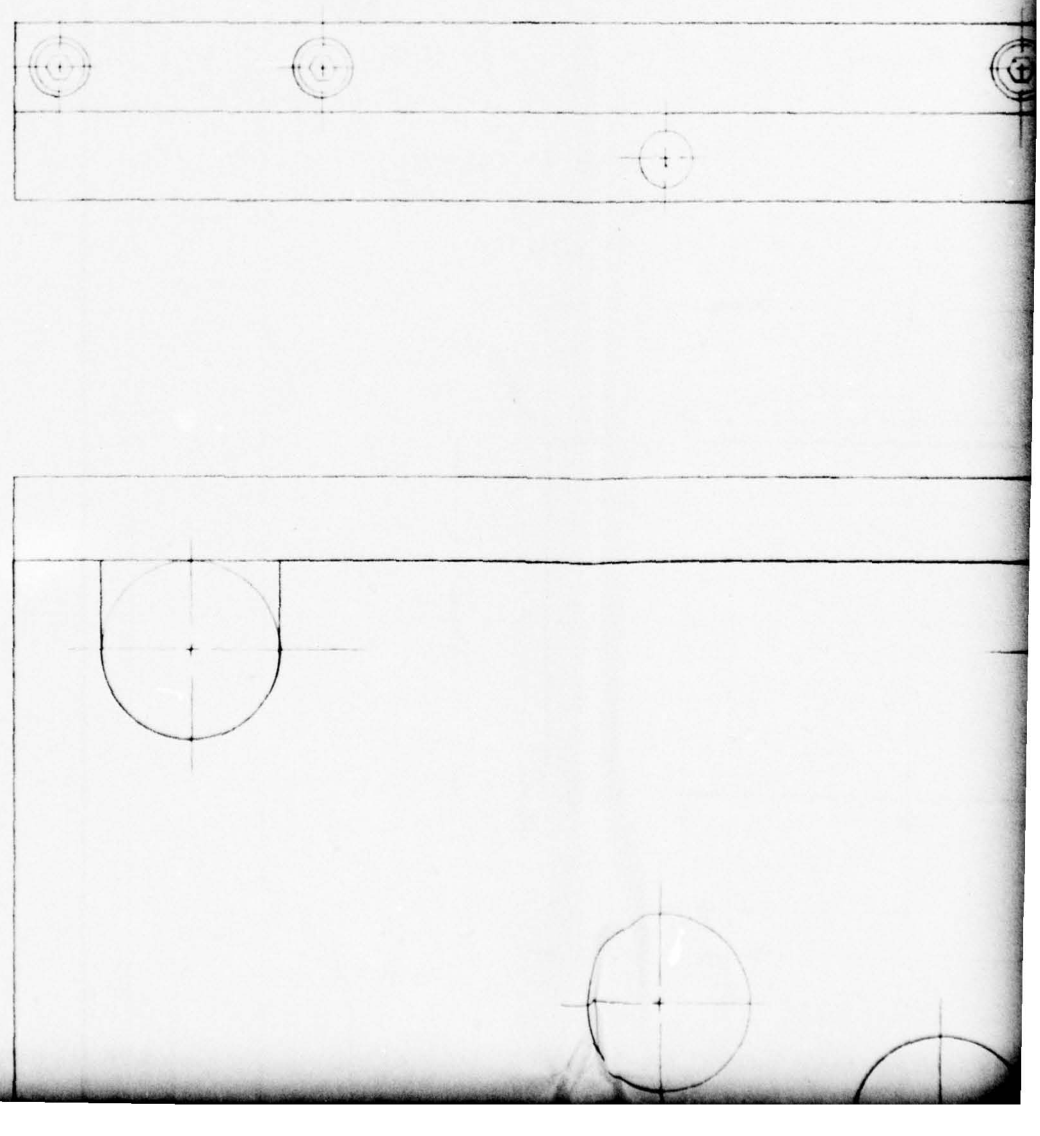

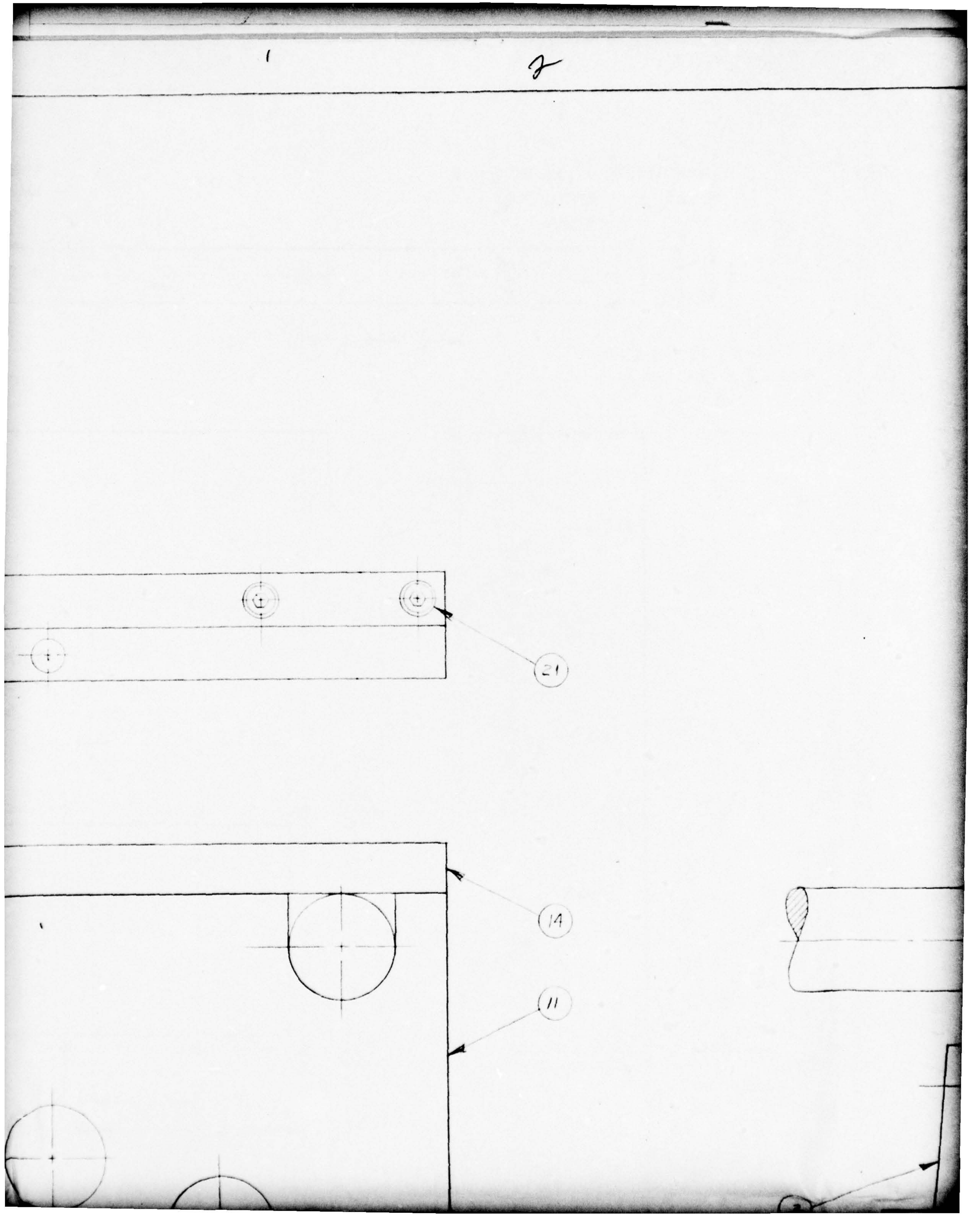
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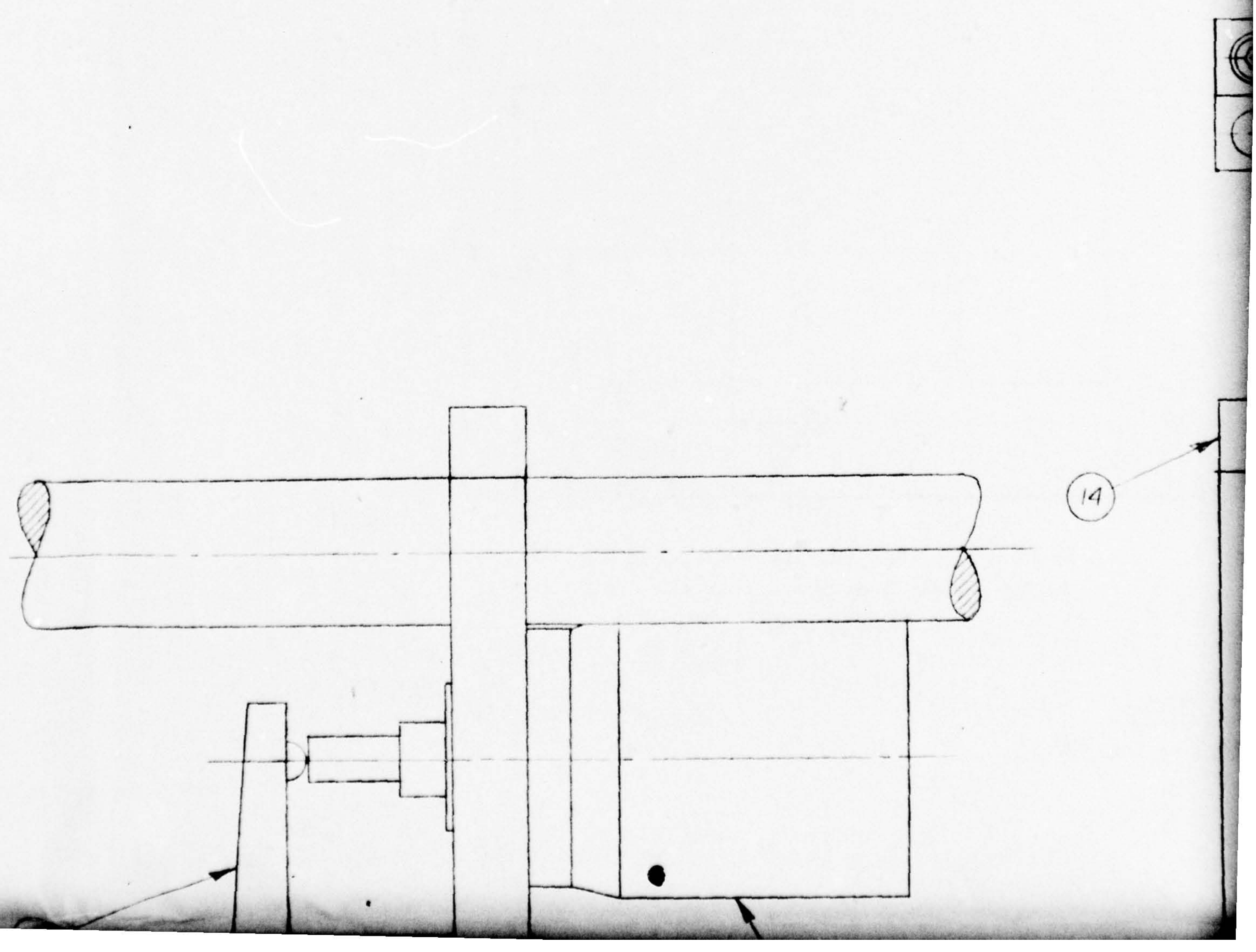
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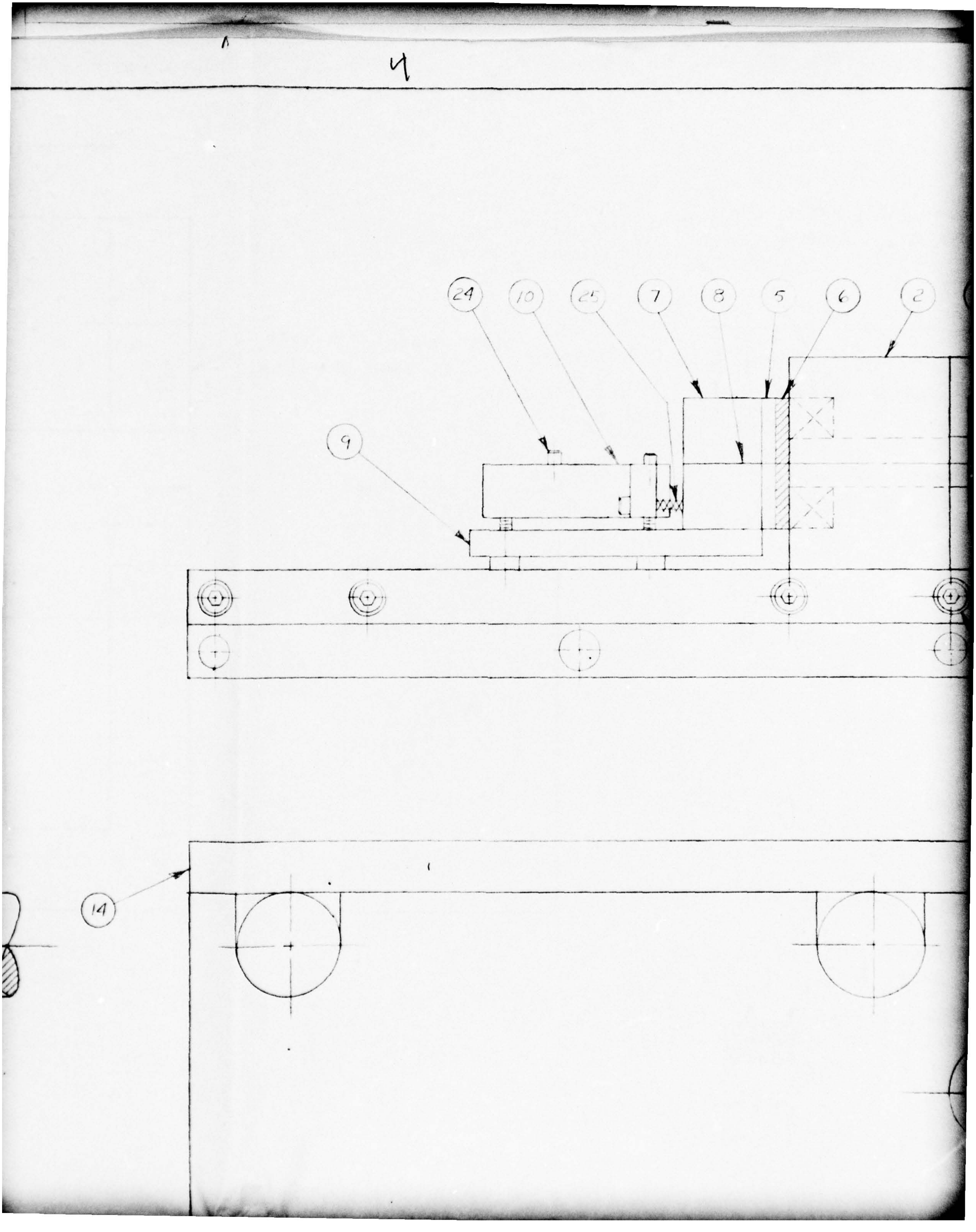
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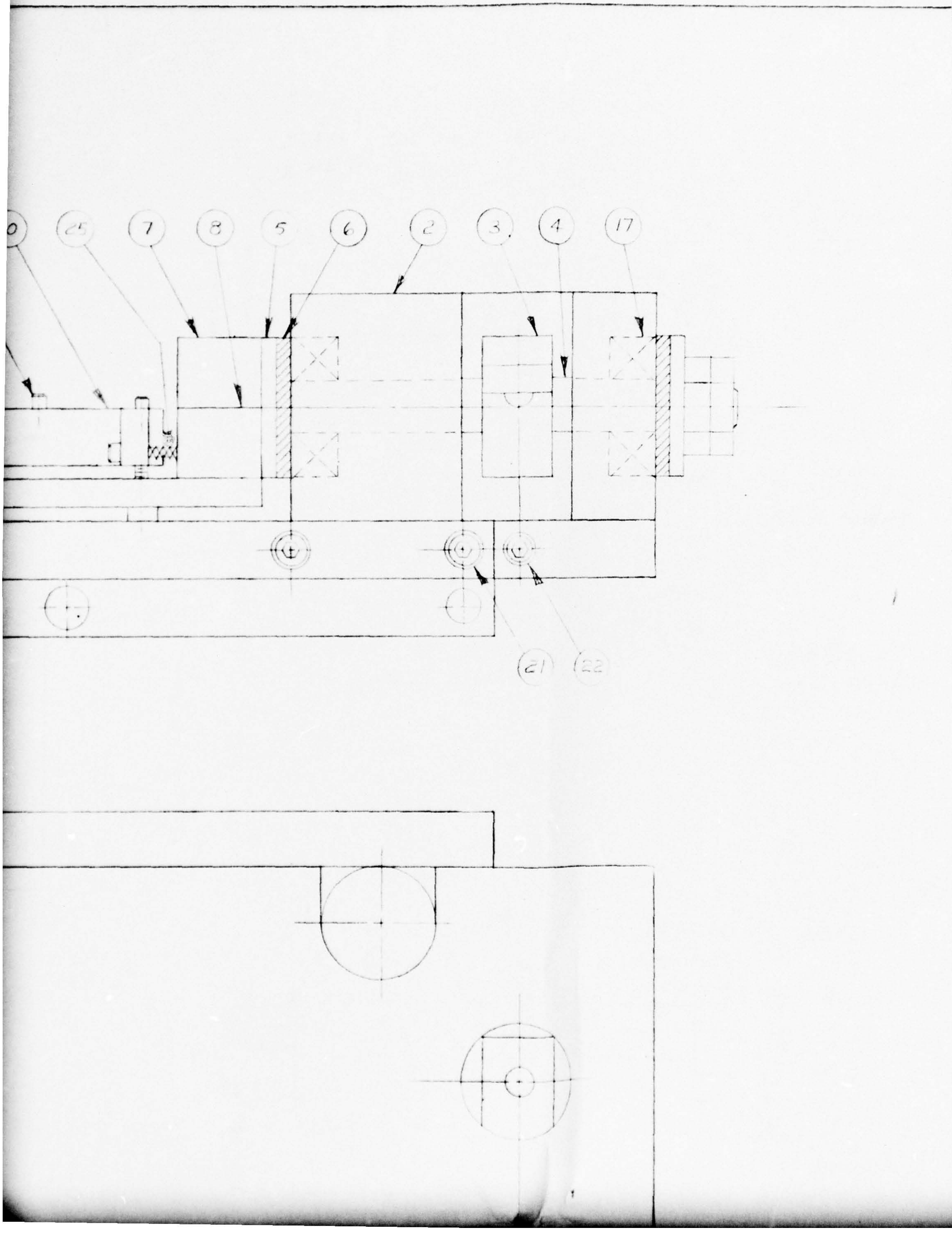
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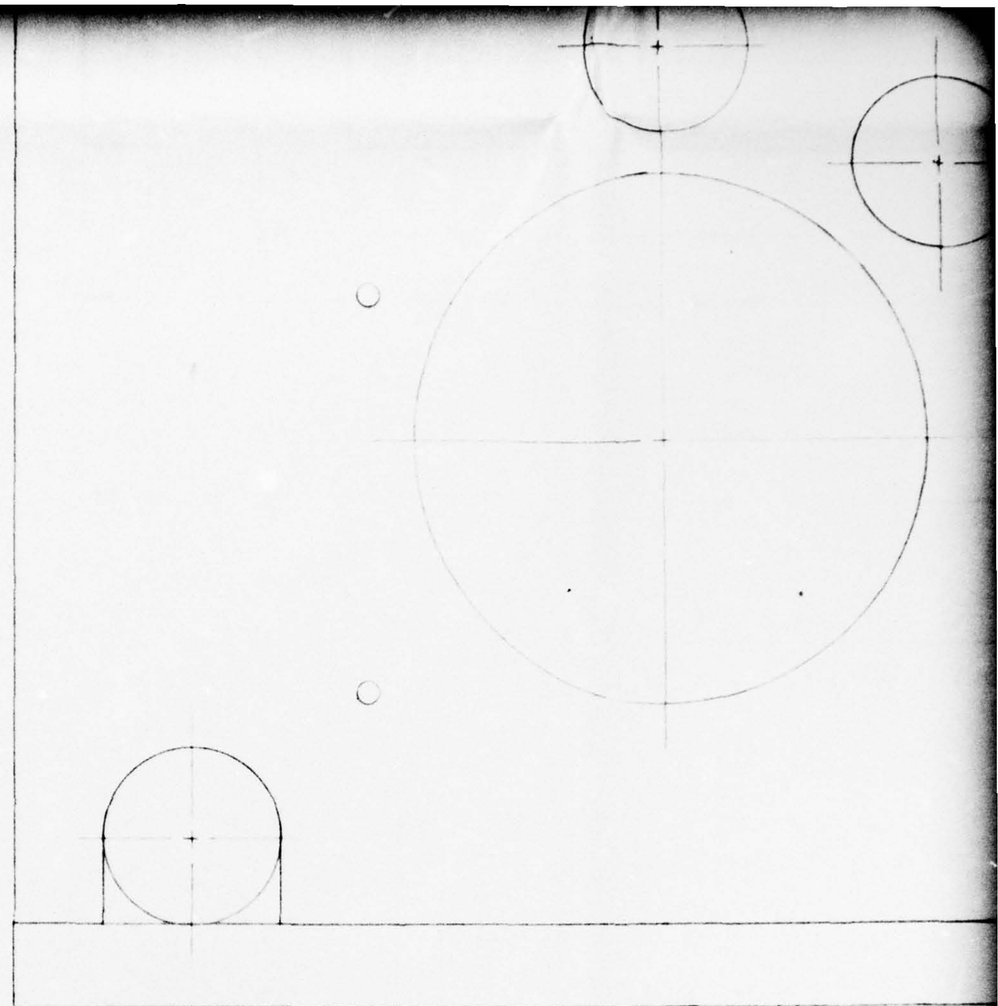
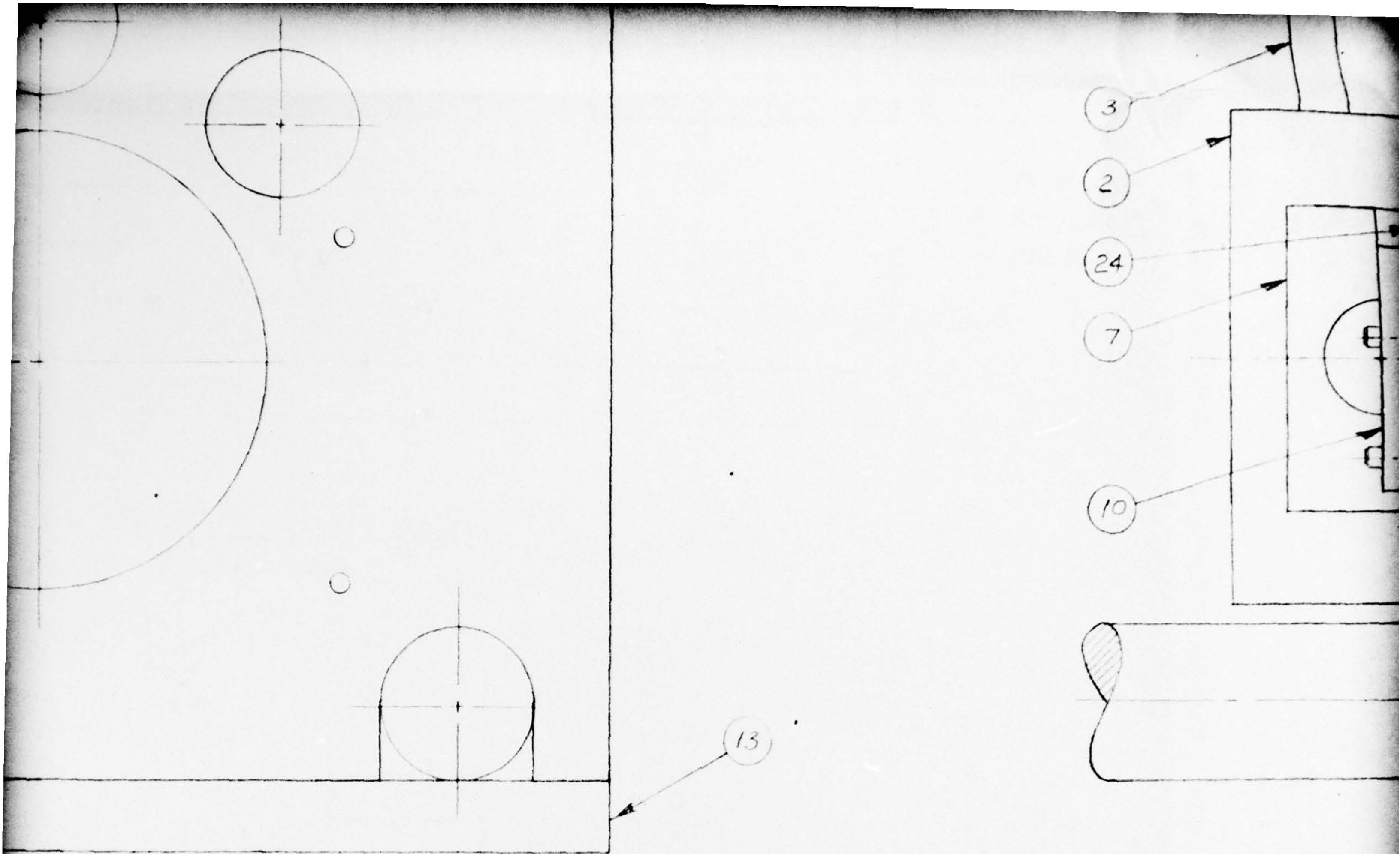


OUTPUT MOUNT PLATE ASSEMBLY



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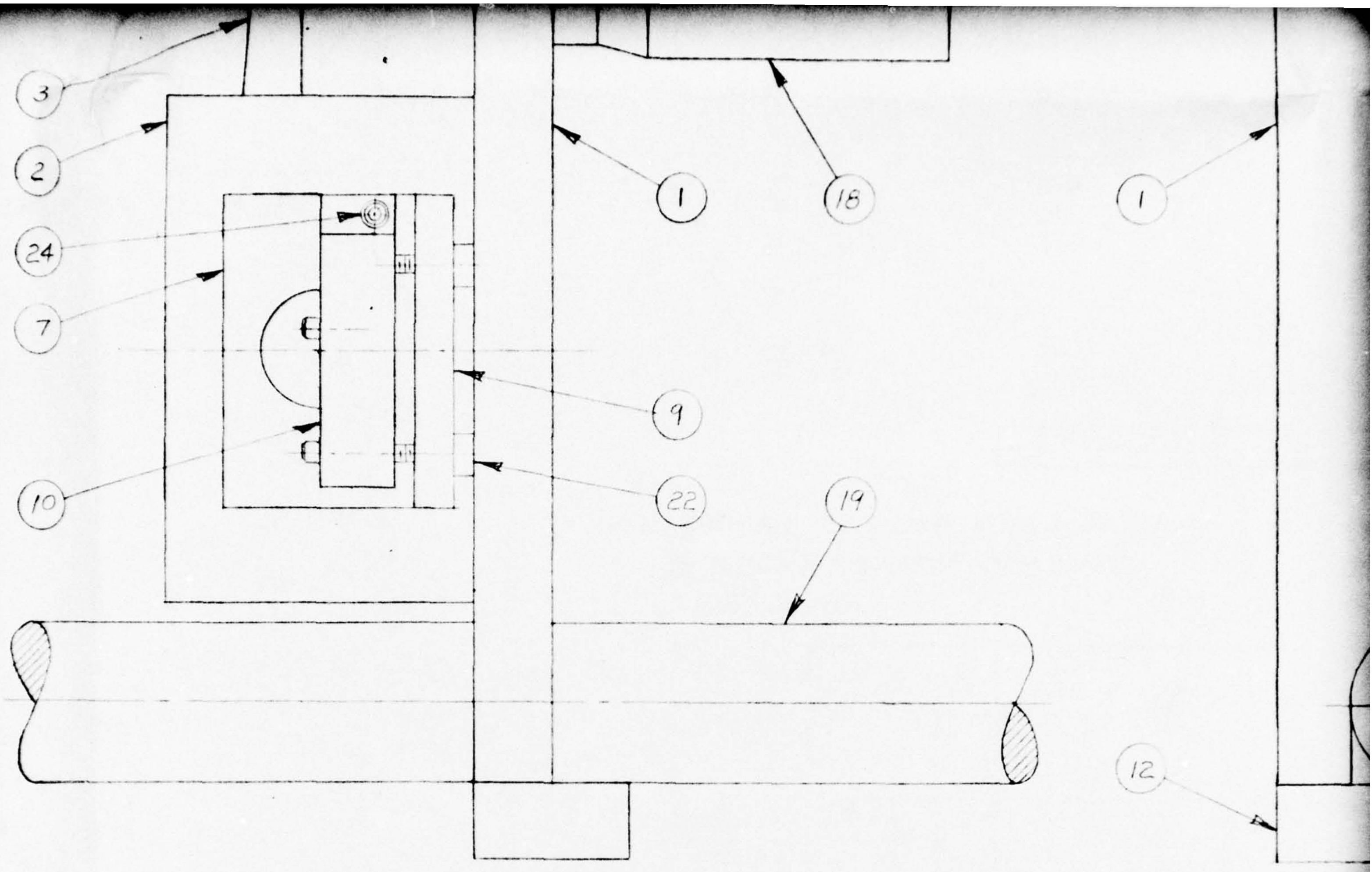

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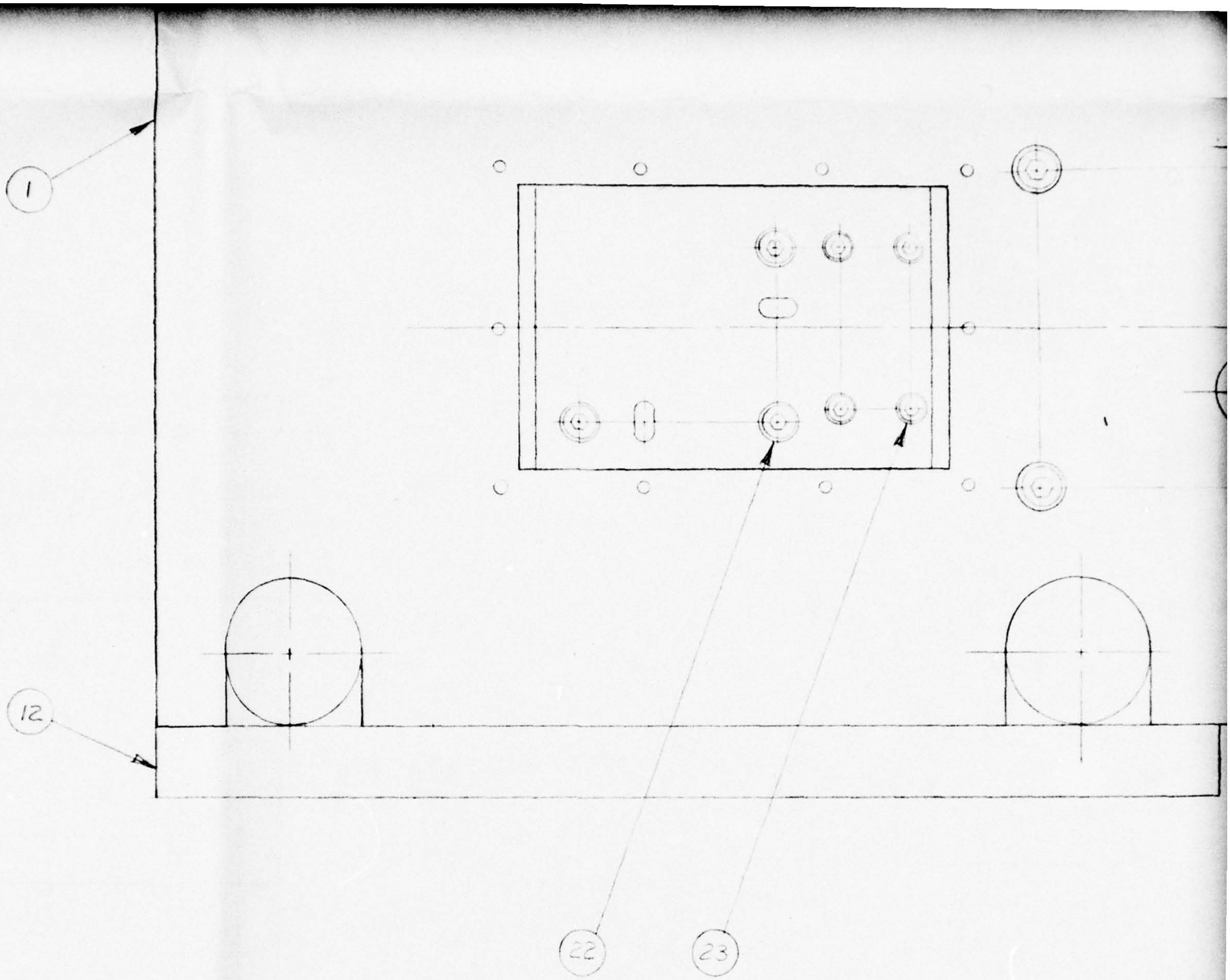

RATING TABLE ASSEMBLY

ALL WORK & MATERIAL MUST BE FIRST CLASS UNLESS SPECIFICALLY NOTED OTHERWISE

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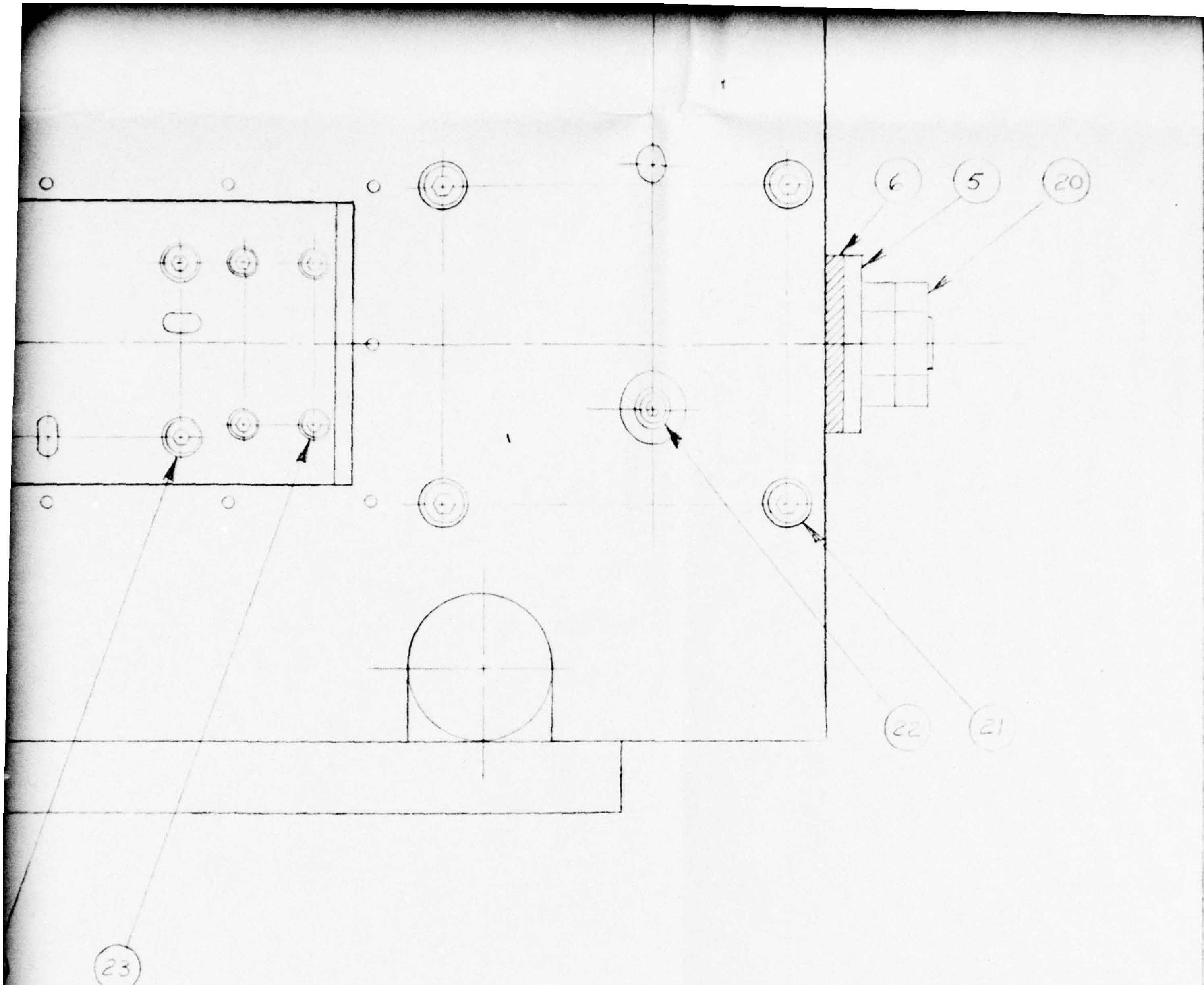
APPROVED



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THE OHIO STATE UNIVERSITY
ELECTROSCIENCE LABORATORY

DATE 7-15-76	GRATING TABLE	SHEET 1 OF 3
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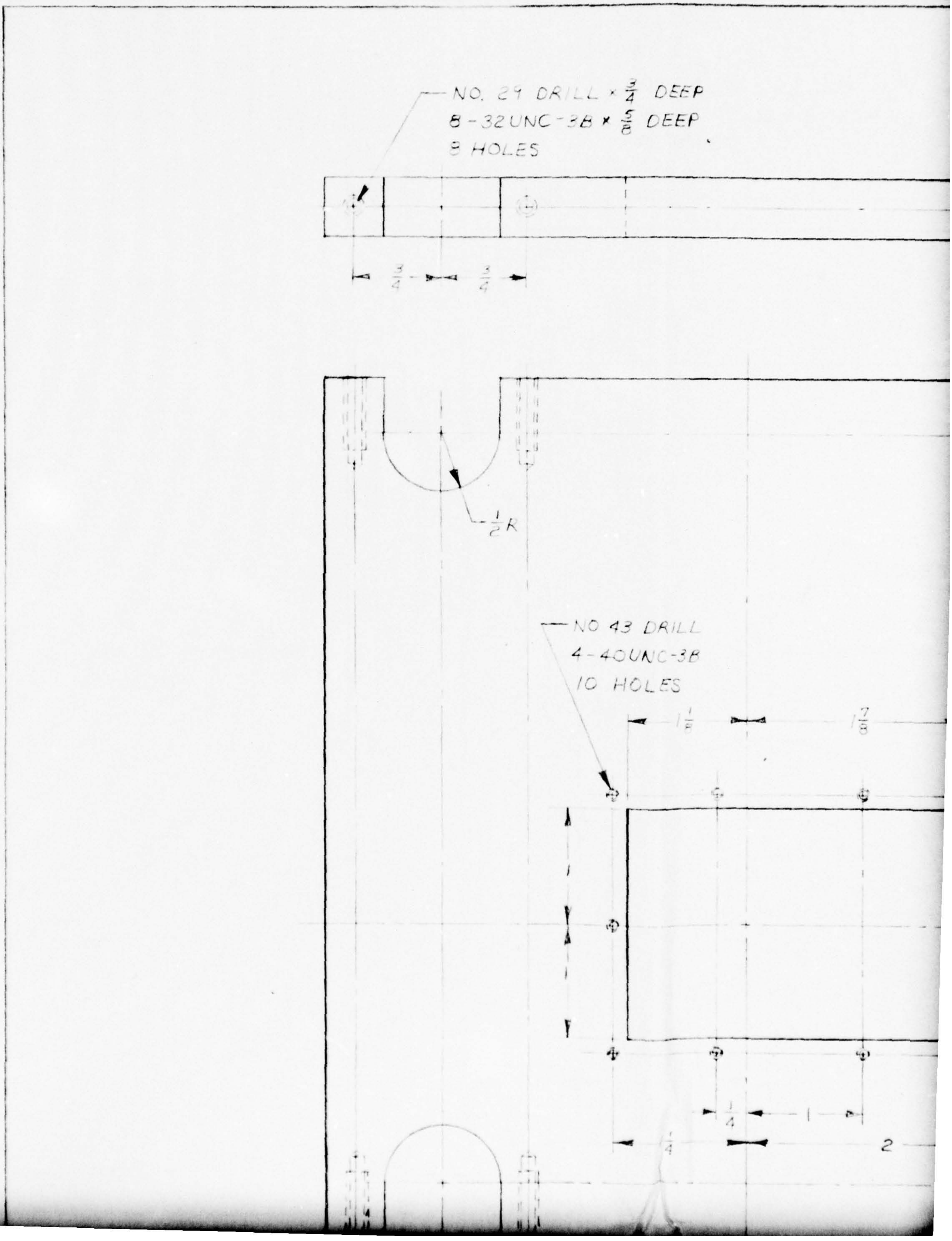
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8-32UNC-3B × 5/8 DEEP
8 HOLES
3/4
3/4
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NO 43 DRILL
4-40UNC-3B
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1 1/8
1 7/8
1
1/4
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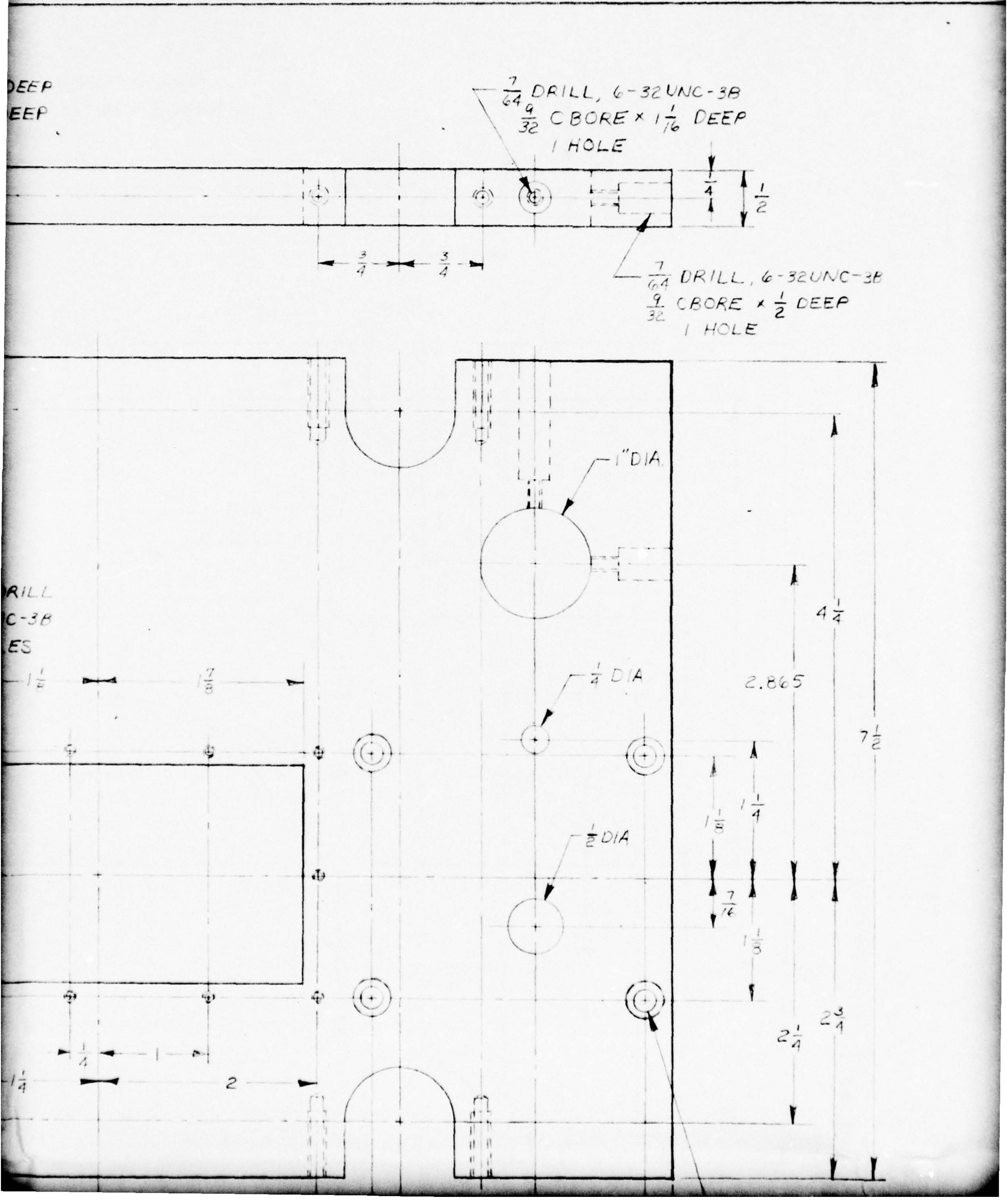
1/4
2



DEEP
EEP
7/64 DRILL, 6-32UNC-3B
9/32 CBORE × 1 1/16 DEEP
1 HOLE
1/4
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3/4
3/4
7/64 DRILL, 6-32UNC-3B
9/32 CBORE × 1/2 DEEP
1 HOLE
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ES
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1 7/8
4 1/4
2.865
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7 1/2
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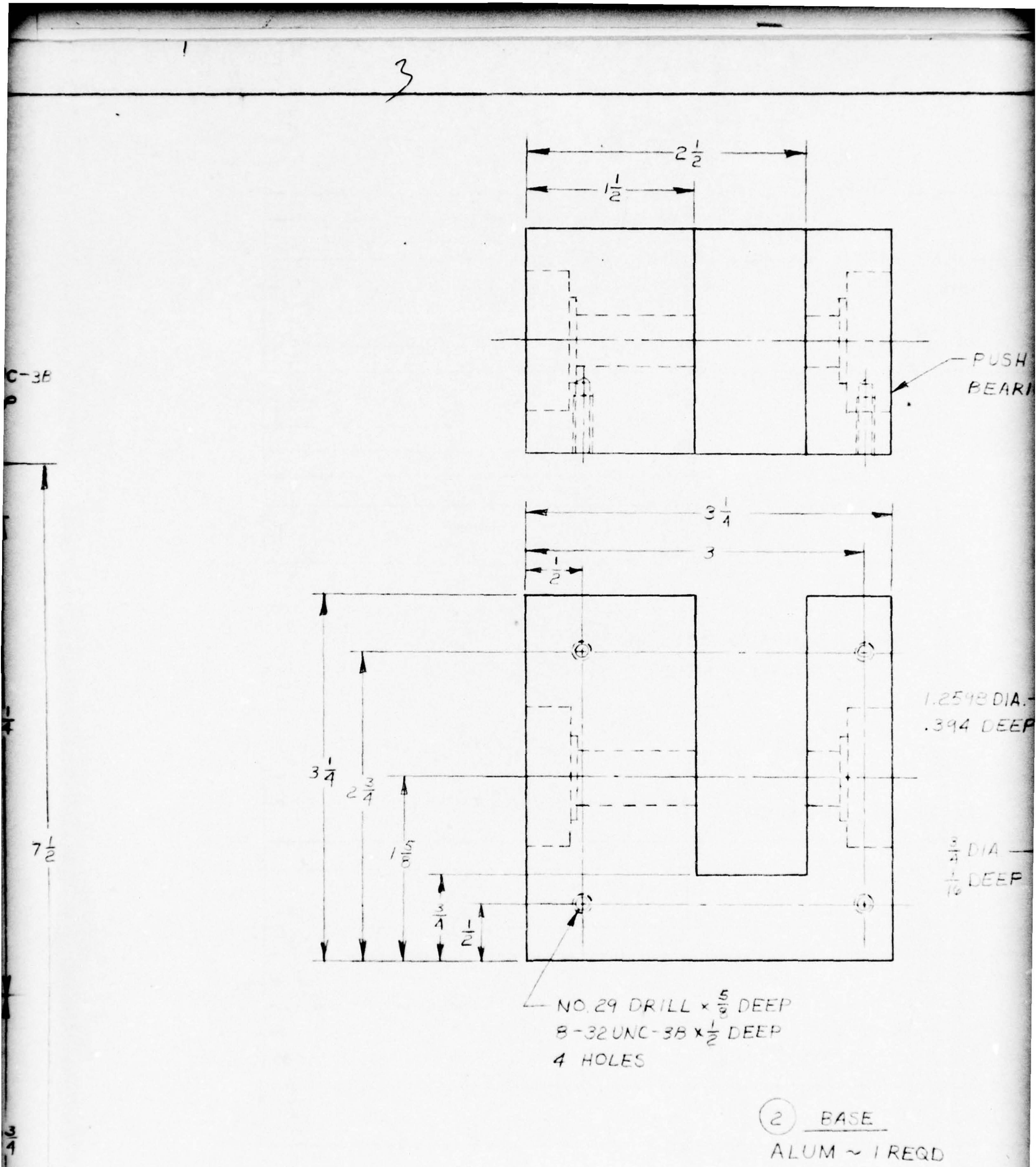
2 3/4
1 1/4



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2 1/2
1 1/2
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C-3B
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.394 DEEP
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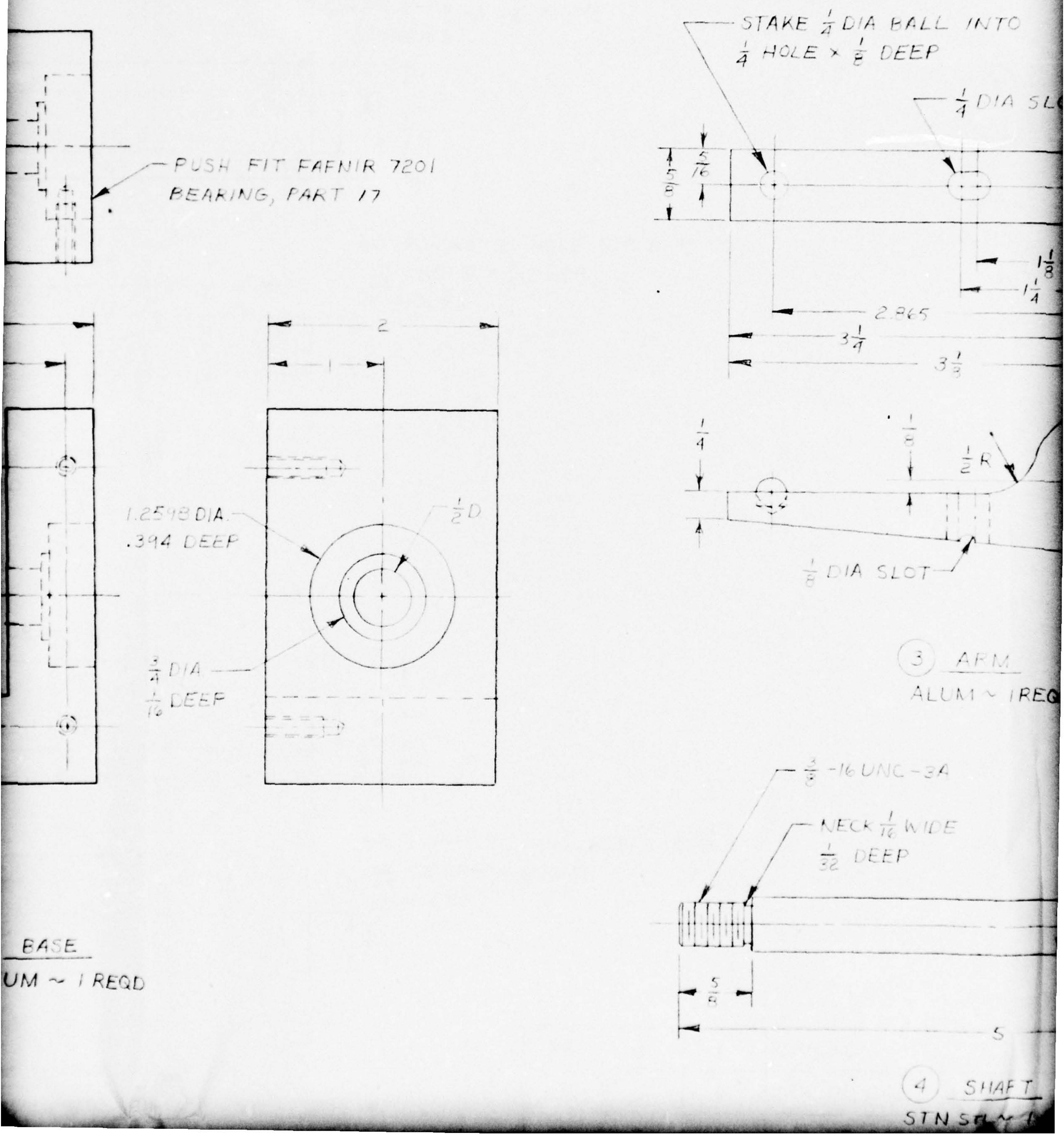
2 3/4
1 5/8
3/4
1/2
7 1/2
3/4 DIA.
1/16 DEEP
NO. 29 DRILL × 5/8 DEEP
8-32 UNC-3B × 1/2 DEEP
4 HOLES
2 BASE
ALUM ~ 1 REQD

4



PUSH FIT FAFNIR 7201
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.394 DEEP
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3/4 DIA.
1/16 DEEP
BASE
UM ~ 1 REQD
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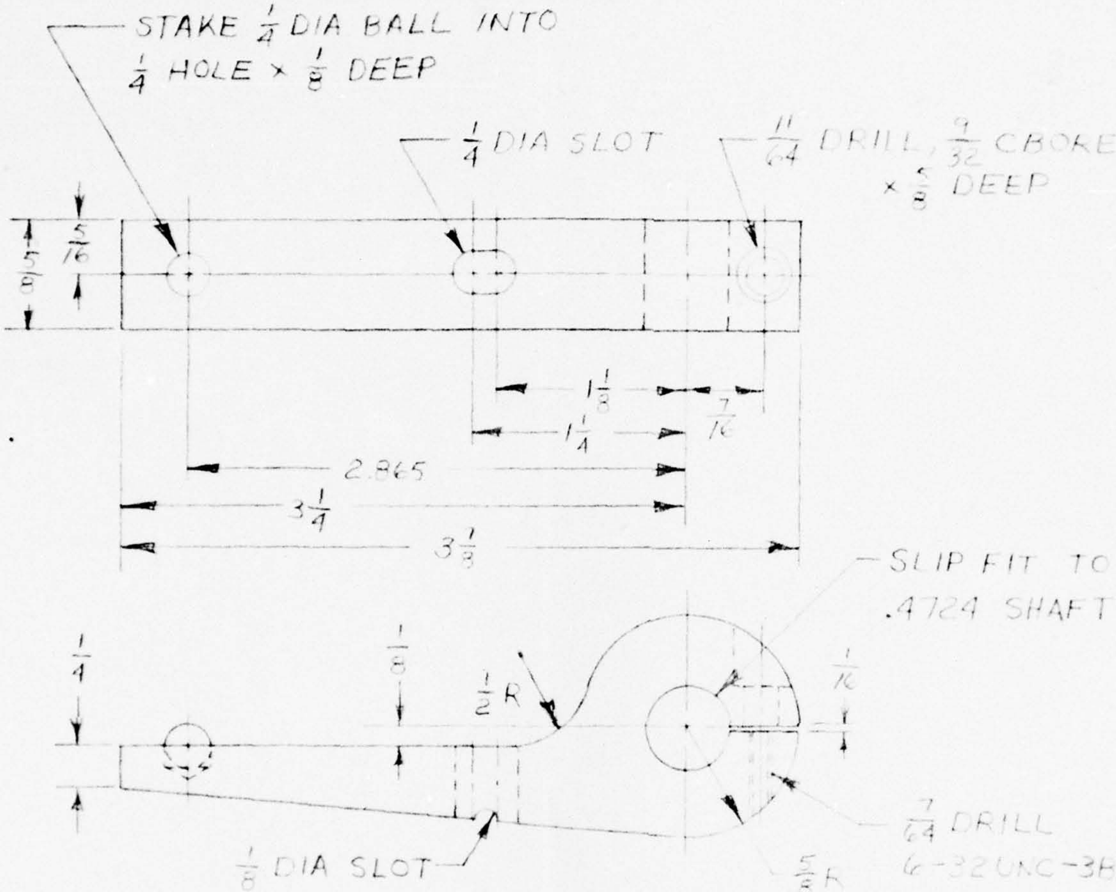
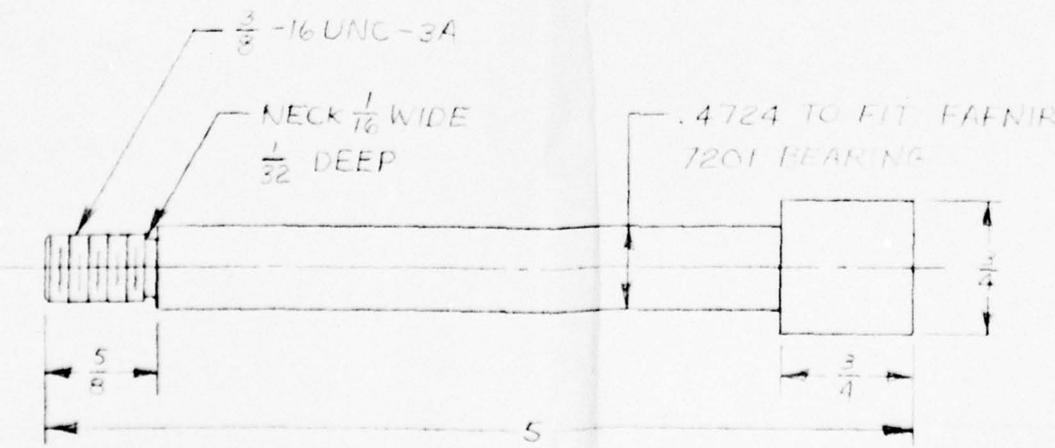
1/4 HOLE × 1/8 DEEP
1/4 DIA SL
5/16
5/8
1 1/8
1 1/4
2.865
3 1/4
3 1/8
1/4
1/8
1/2 R
1/8 DIA SLOT
3 ARM
ALUM ~ 1 REQ
3/8 -16 UNC-3A
NECK 1/16 WIDE
1/32 DEEP
5/8
5
4 SHAFT



(3) ARM
ALUM ~ 1 REQD



(4) SHAFT
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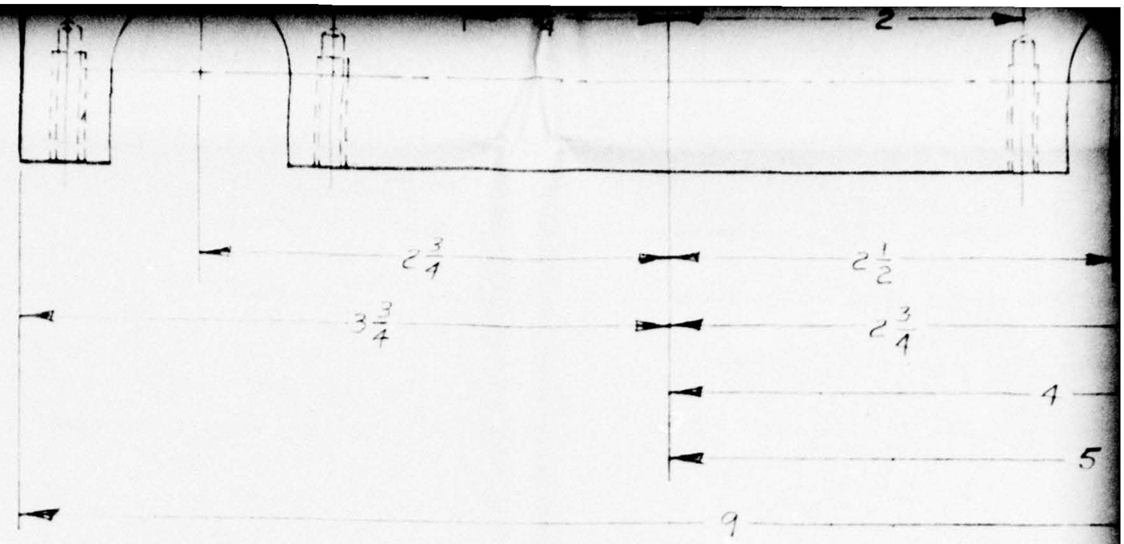
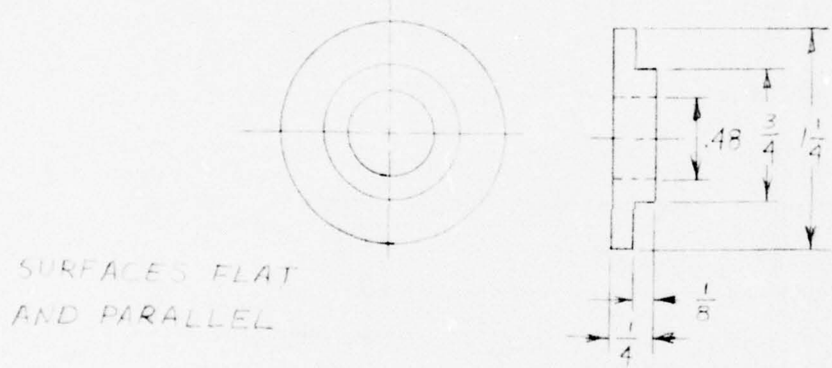


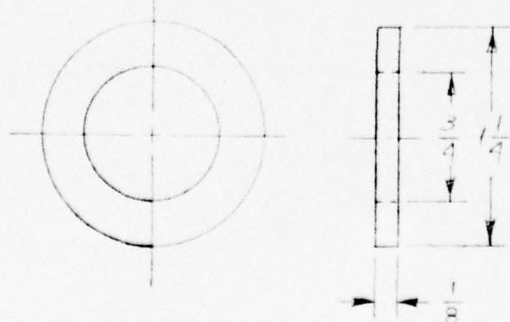
(1) GRATING MOUNT PLATE

ALUM ~ 1 REQD



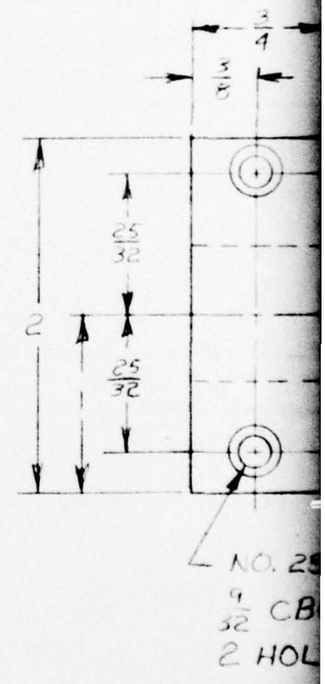
(5) WASHER

ALUM ~ 2 REQD



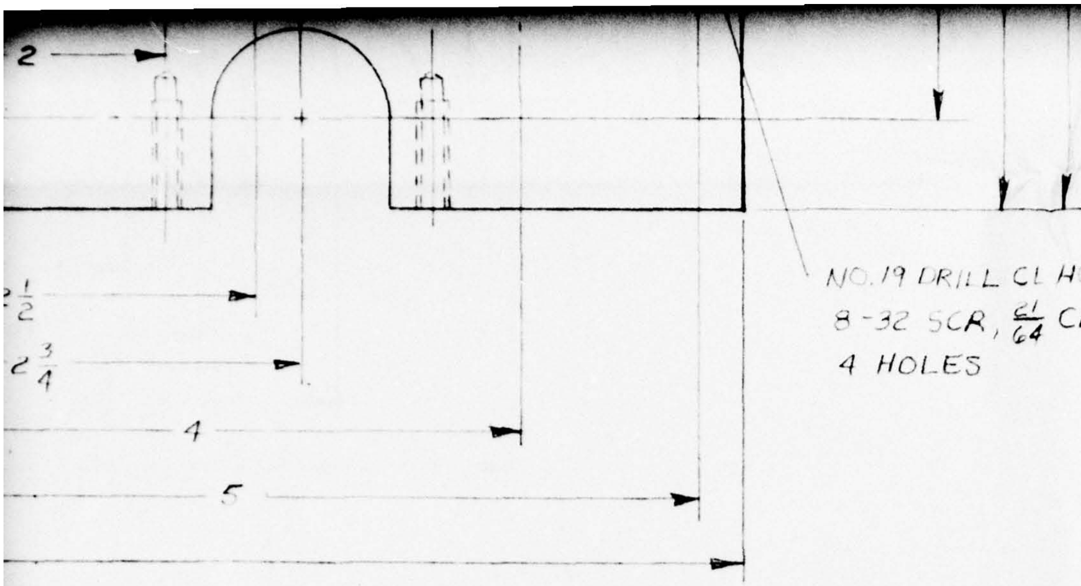
(6) SHIELD

FELT ~ 2 REQD



(7) GRATI

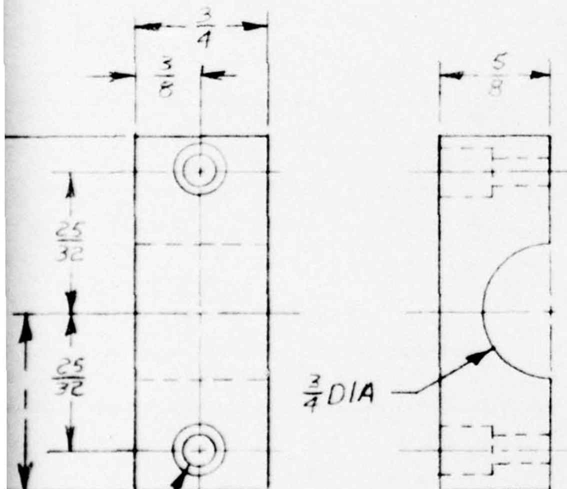
ALUM



NO. 19 DRILL CL HOLE FOR
8-32 SCR, 21/64 CBORE × 3/16 DEEP
4 HOLES

MOUNT PLATE

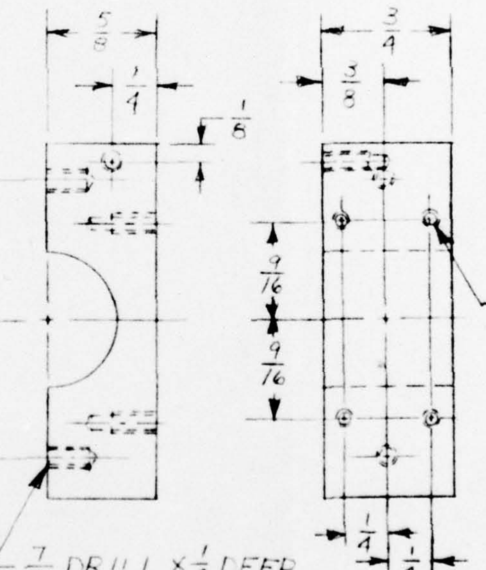
~ 1 REQD



NO. 28 DRILL
9/32 CBORE × 5/16 DEEP
2 HOLES

(7) GRATING TABLE-LEFT

ALUM ~ 1 REQD

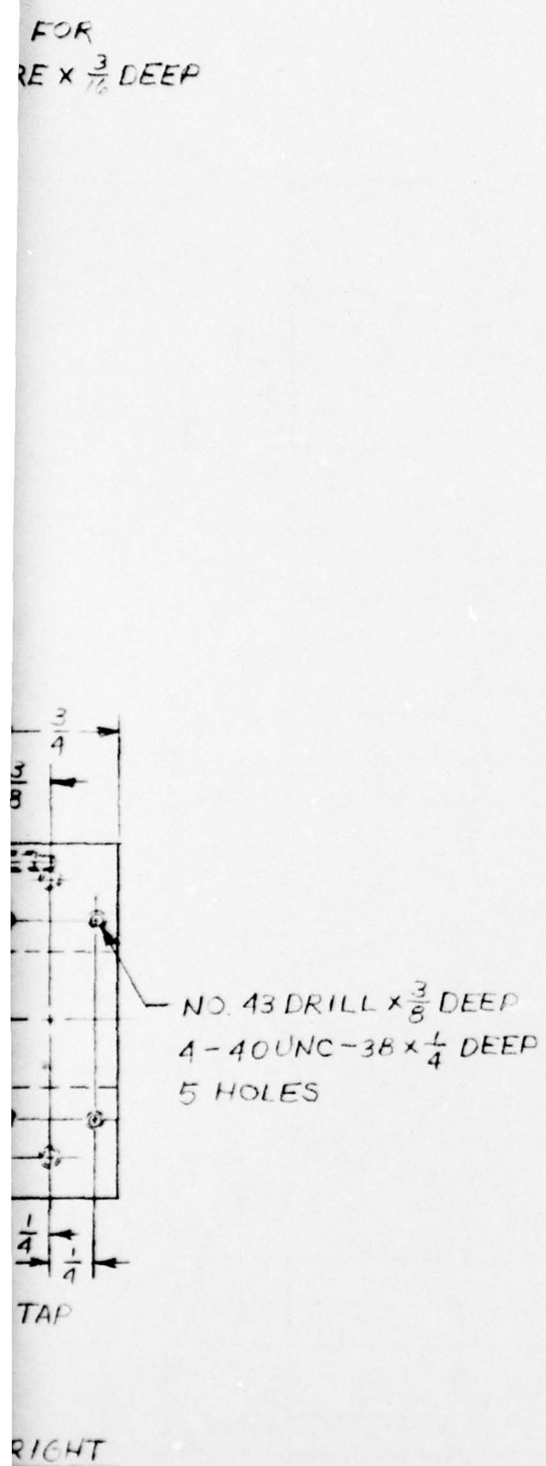


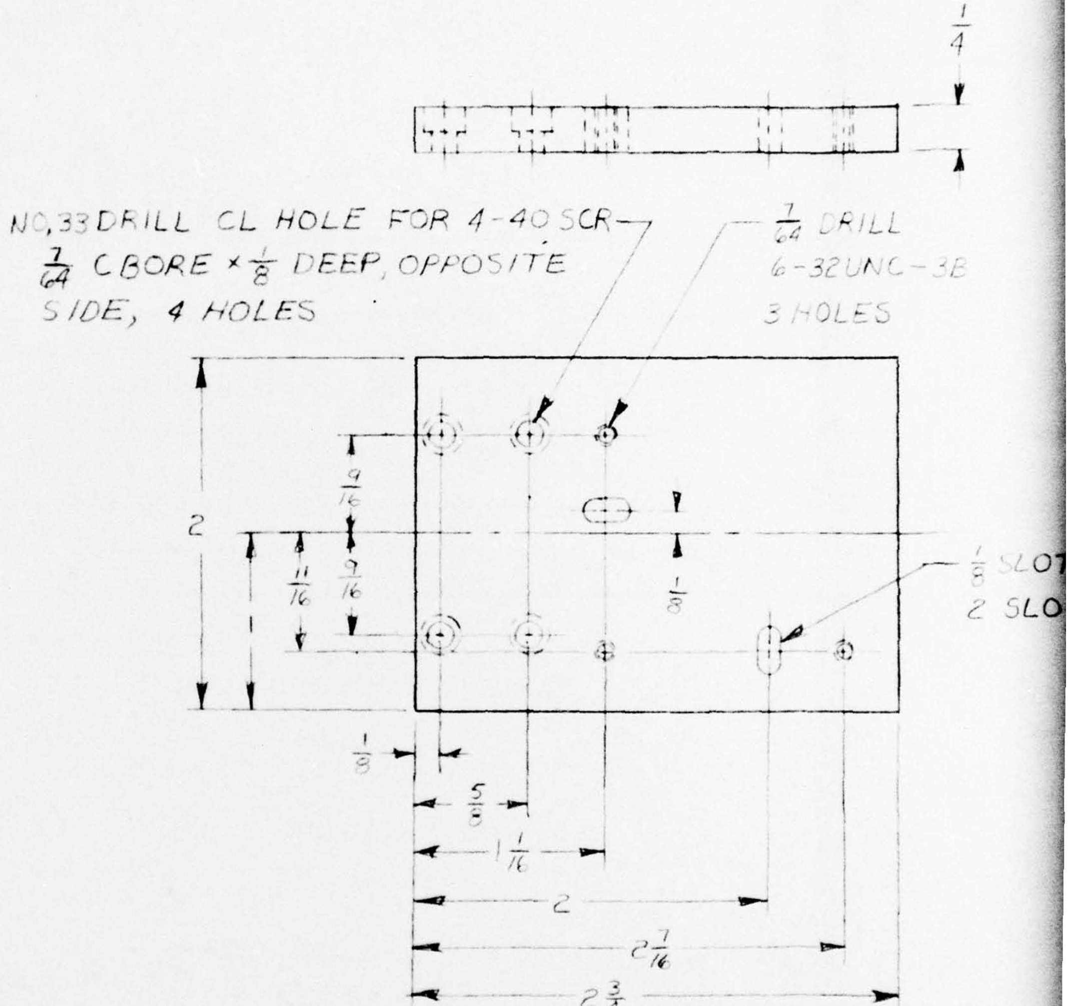
NO. 43 DRILL × 3/8 DEE
4-40UNC-3B × 1/4 DE
5 HOLES

7/64 DRILL × 1/4 DEEP
6-32UNC-3B BOTTOM TAP
2 HOLES

(8) GRATING TABLE-RIGHT

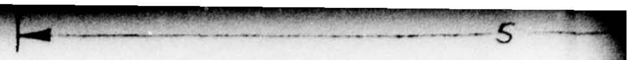
ALUM ~ 1 REQD





9 TABLE MOUNT

ALUM ~ 1 REQD



(4) SHAFT

STN STL ~ 1 RE

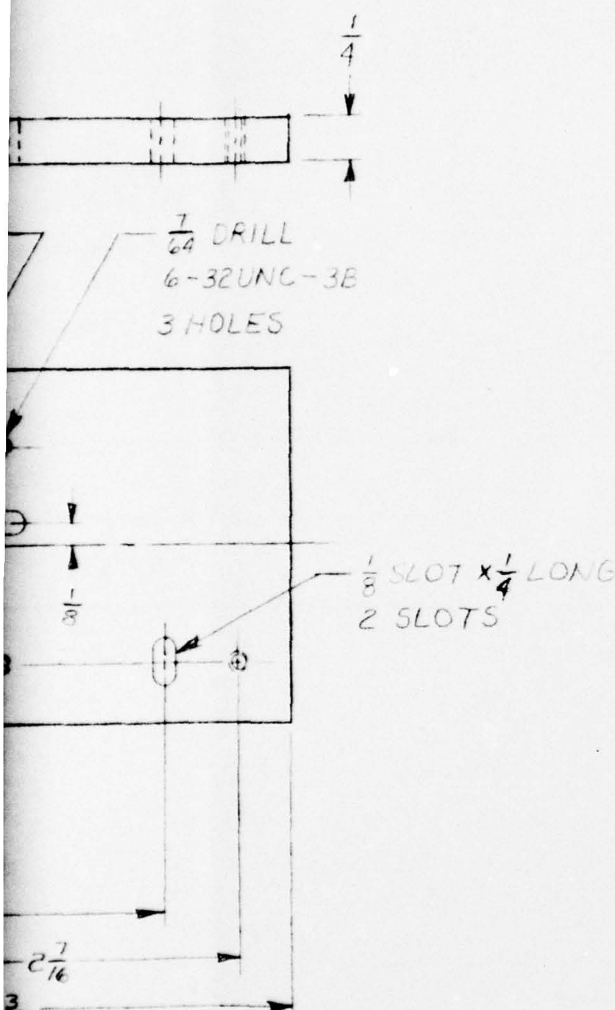
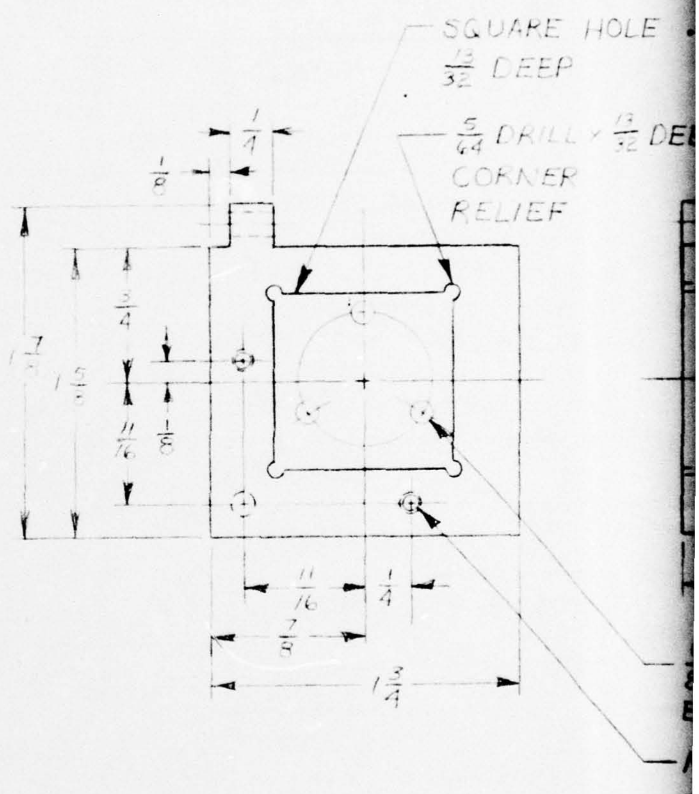


TABLE MOUNT

UM ~ 1 REQD

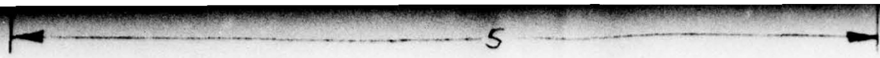


(10) MOUNT

ALUM ~ 1 REQD

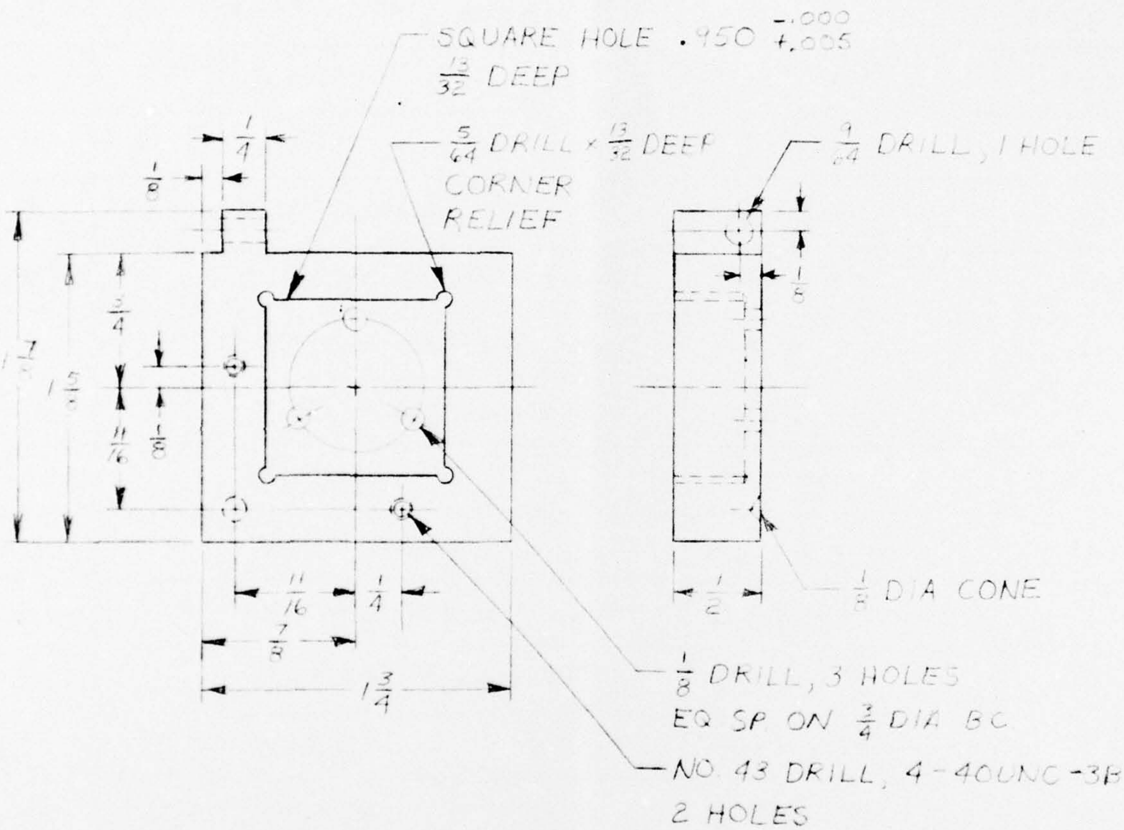
THE OHIO ST
ELECTROSCIE

DATE 7-15-76	GRAT
SCALE FULL	
DRAWN J GIBSON	
CHECKED	
APPROVED	



(4) SHAFT

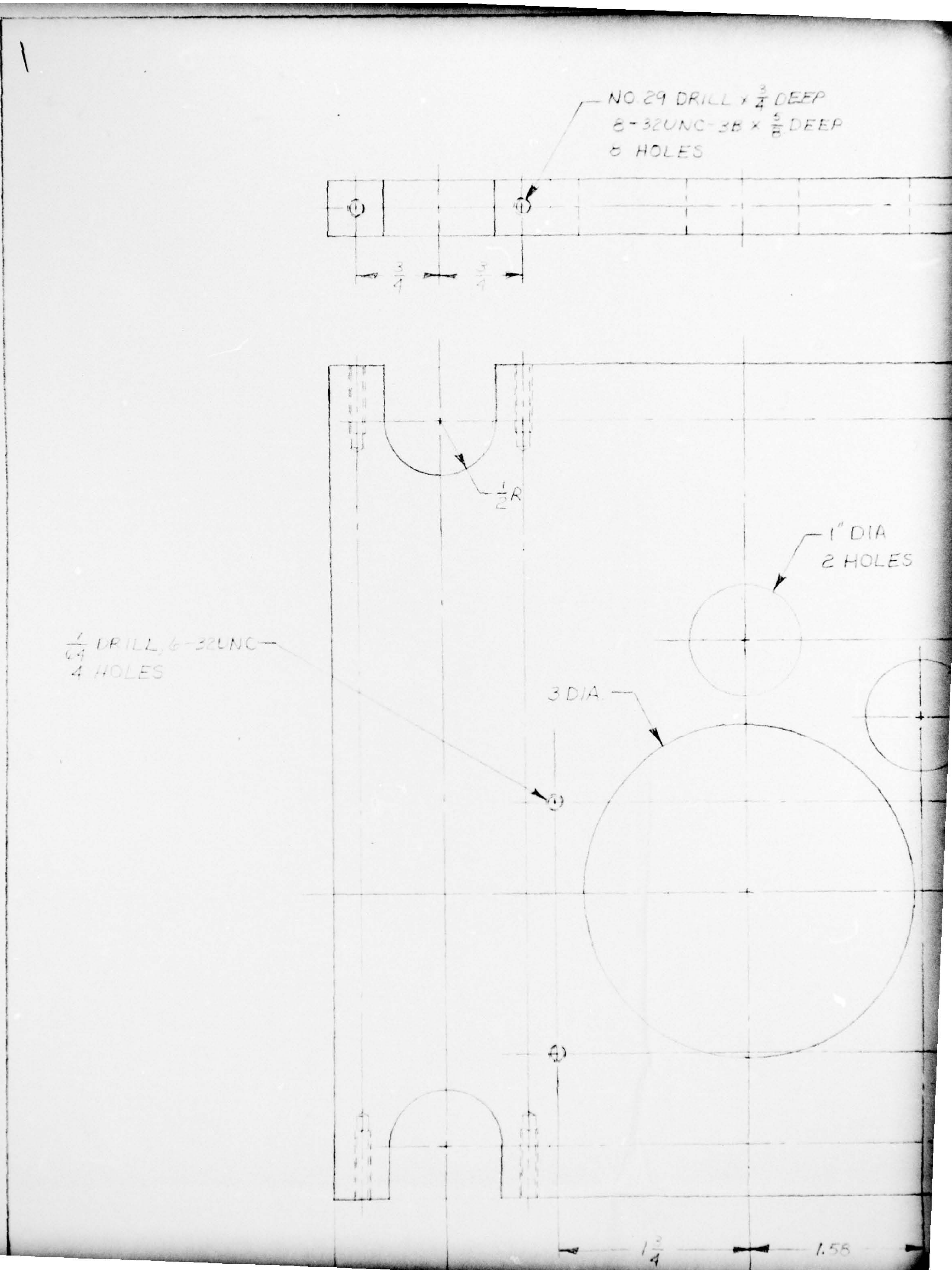
STN STL ~ 1 REQD

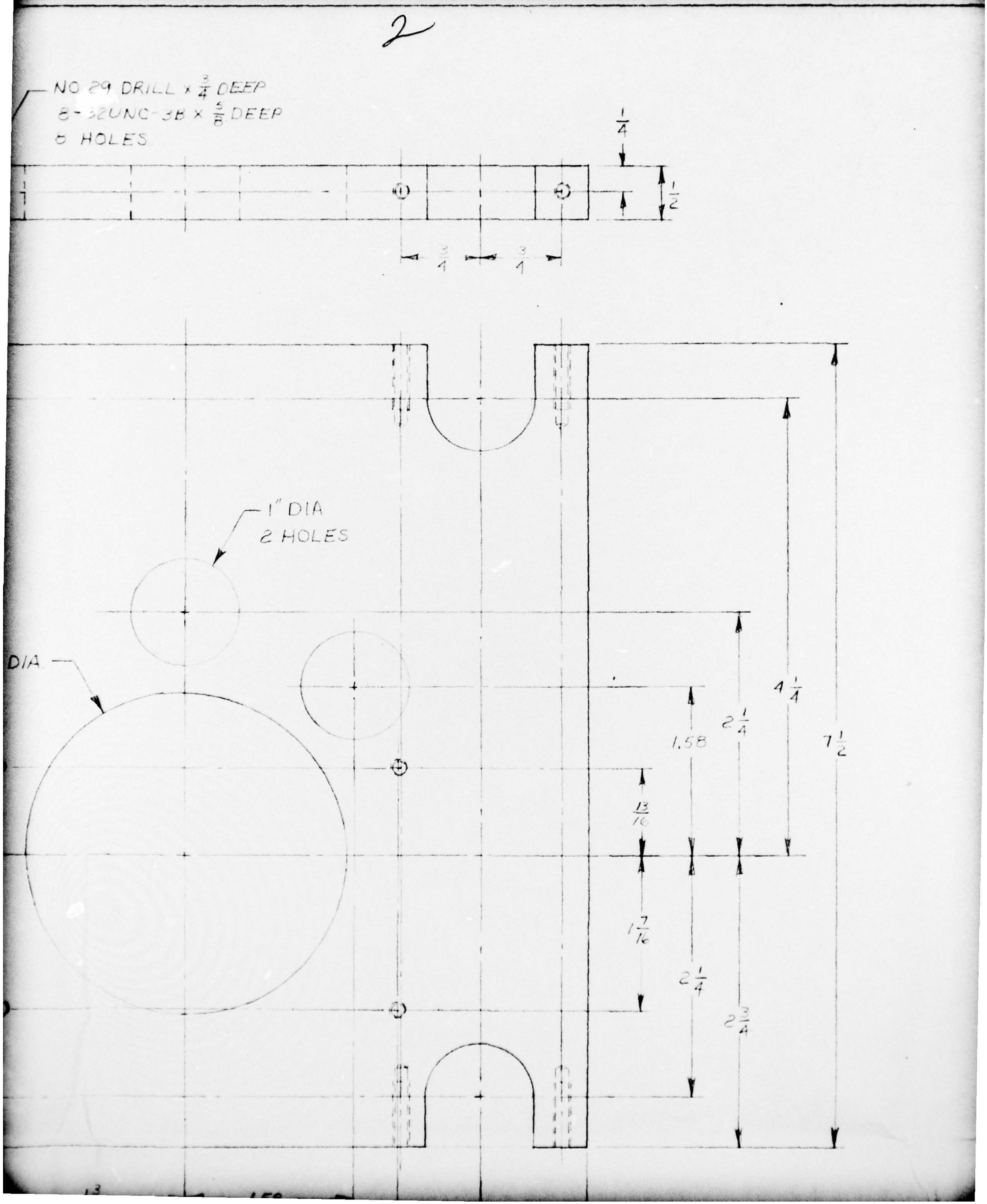


(10) MOUNT

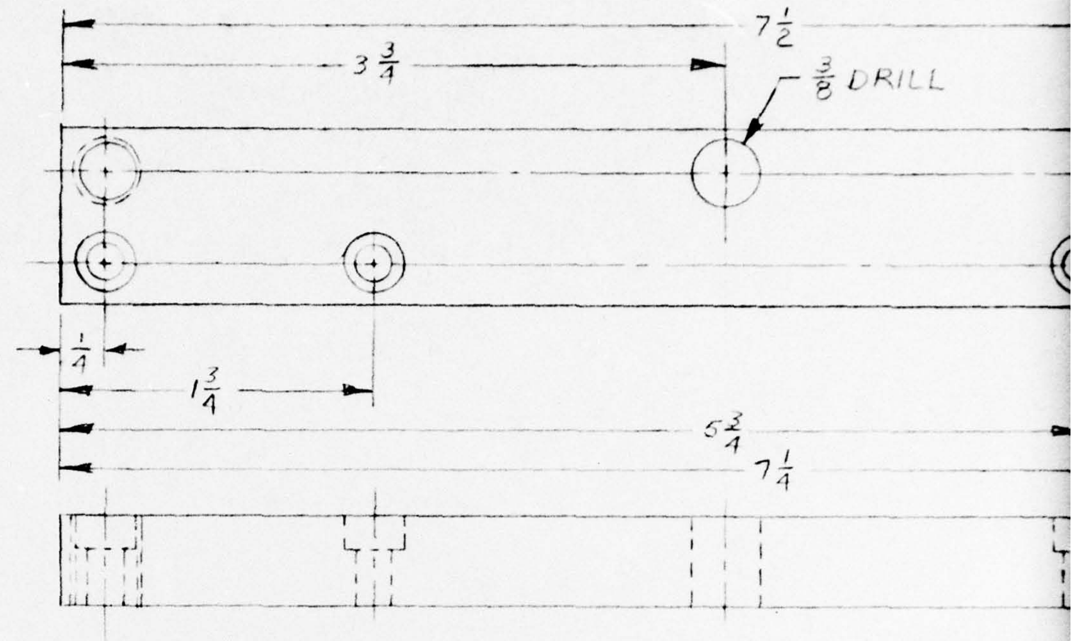
ALUM ~ 1 REQD

THE OHIO STATE UNIVERSITY ELECTROSCIENCE LABORATORY		
DATE 7-15-76	GRATING TABLE	SHEET 2 OF 3
SCALE FULL		PROJECT 4430
DRAWN J. GIBSON		D-429
CHECKED		
APPROVED		

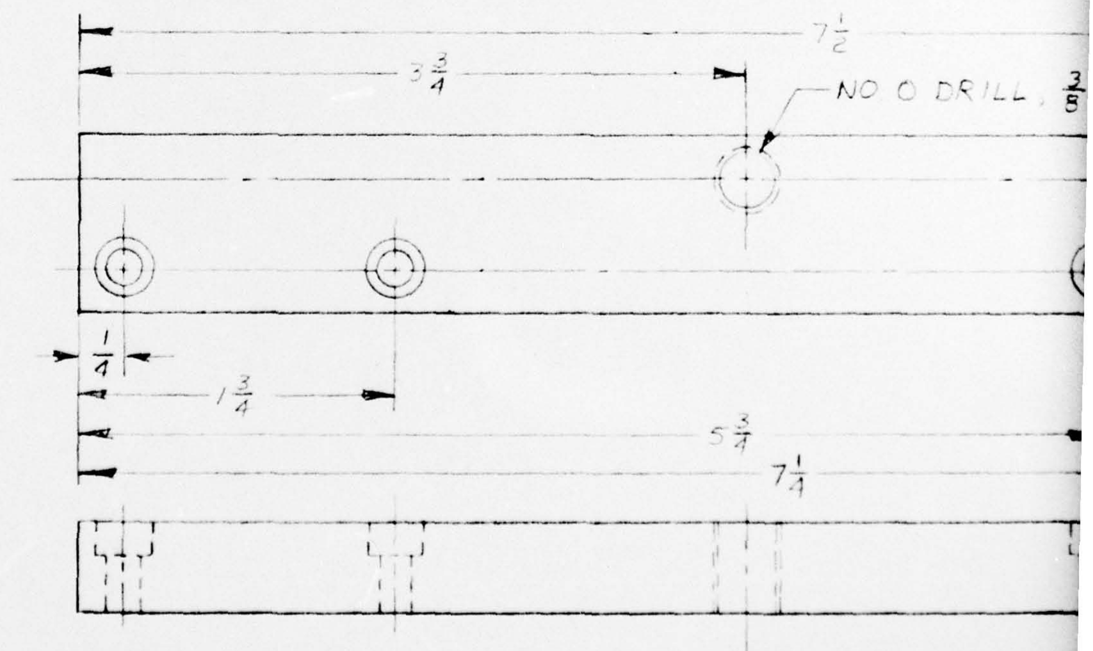

NO. 29 DRILL × 3/4 DEEP
8-32UNC-3B × 5/8 DEEP
8 HOLES
3/4
3/4
1/2 R
1" DIA
2 HOLES
7/64 DRILL, 6-32UNC
4 HOLES
3 DIA.
1 3/4
1.58

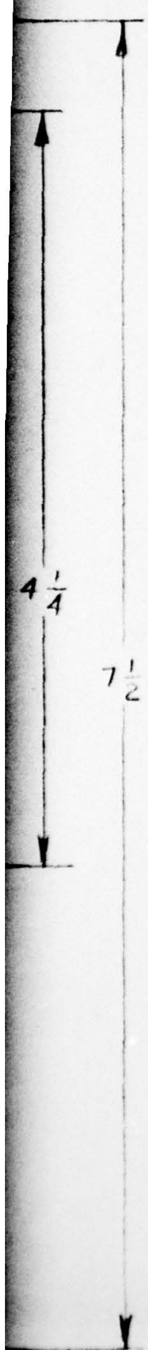


2
NO 29 DRILL × 3/4 DEEP
8-32UNC-3B × 5/8 DEEP
6 HOLES
1/4
1/2
3/4
3/4
1" DIA
2 HOLES
DIA
4 1/4
2 1/4
1.58
7 1/2
13/16
1 7/16
2 1/4
2 3/4

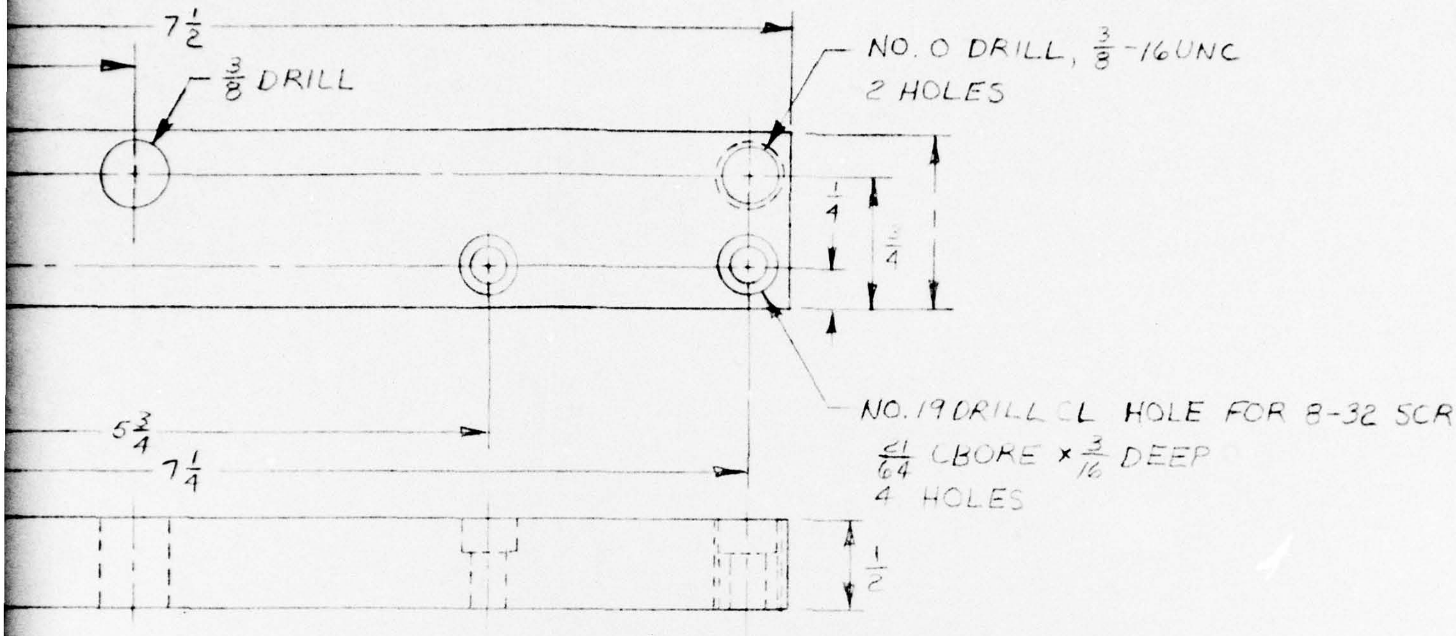


(12) BOTTOM GRATING CLAMP
ALUM ~ 1 REQD



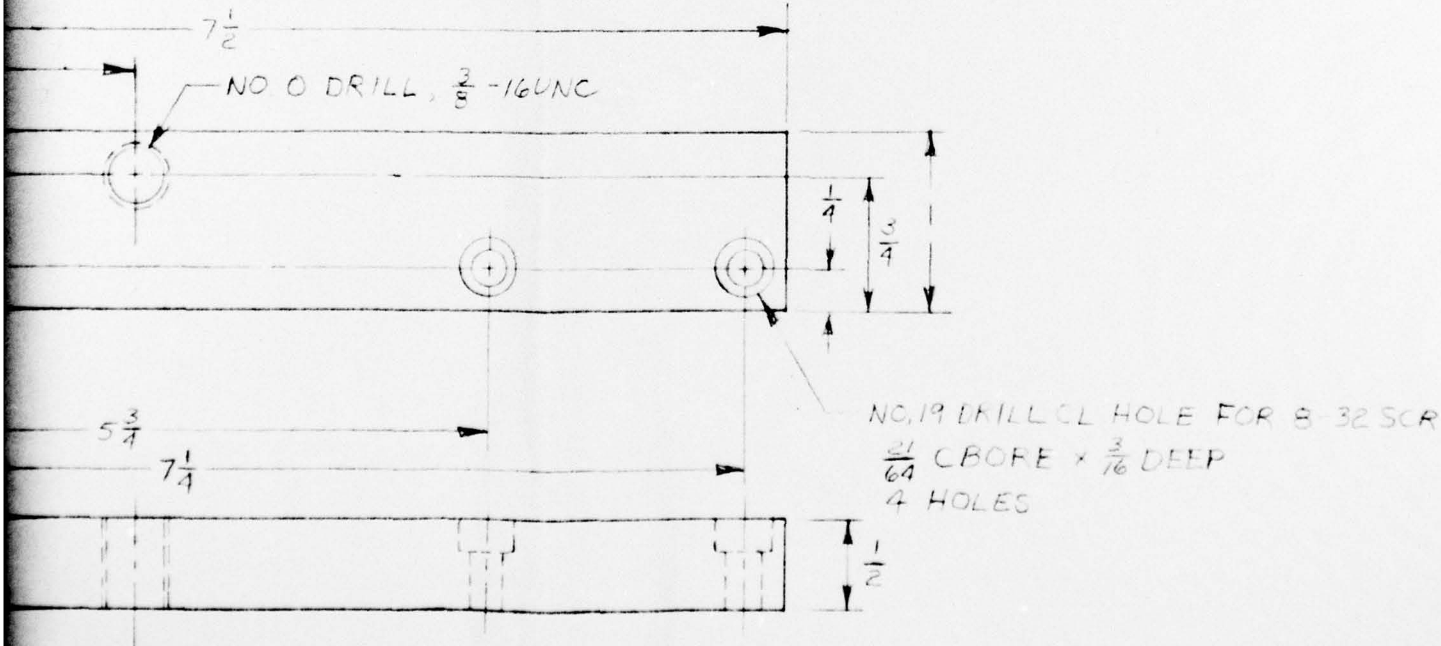


(13) BOTTOM OUTPUT CLAMP
ALUM ~ 1 REQD



BOTTOM GRATING CLAMP

ALUM ~ 1 REQD



BOTTOM OUTPUT CLAMP

ALUM ~ 1 REQD

25	3	1	SPRIN
24	3	3	SOC HD
23	3	4	SOC HD

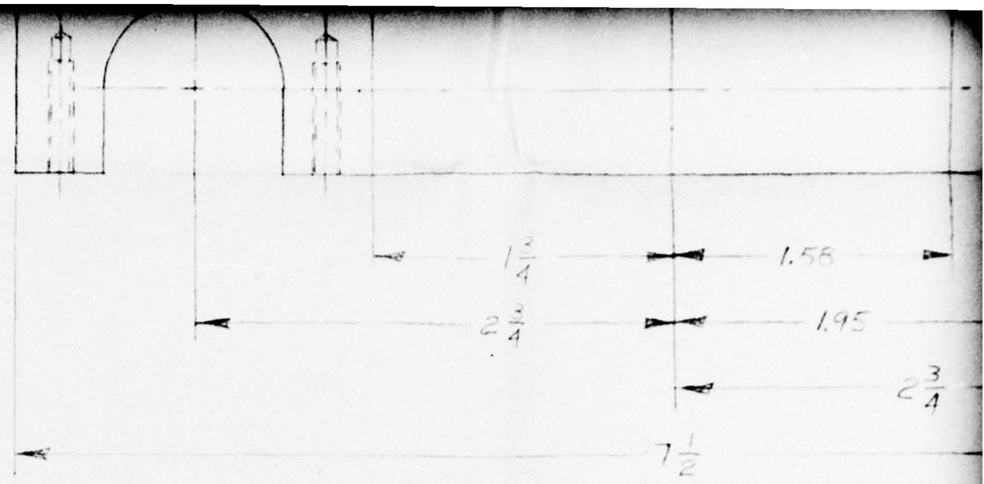
5

DRILL, 3/8-16UNC
LES

DRILL CL HOLE FOR 8-32 SCR
BORE × 3/16 DEEP
OLES

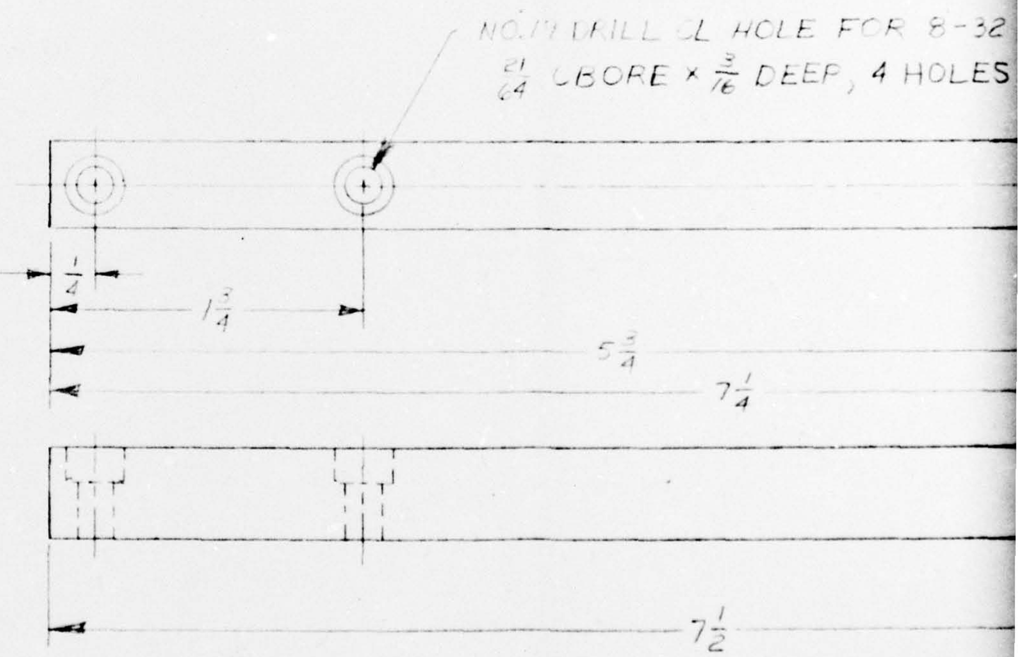
DRILL CL HOLE FOR 8-32 SCR
CBORE × 3/16 DEEP
HOLES

25	3	1	SPRING	—	—
24	3	3	SOC HD CAP SCR	4-40UNC-3A × 3/4	STN STL
23	3	4	SOC HD CAP SCR	4-40UNC-3A × 1/4	STN STL
22	3	8	SOC HD CAP SCR	6-32 UNC-3A × 1/2	STN STL



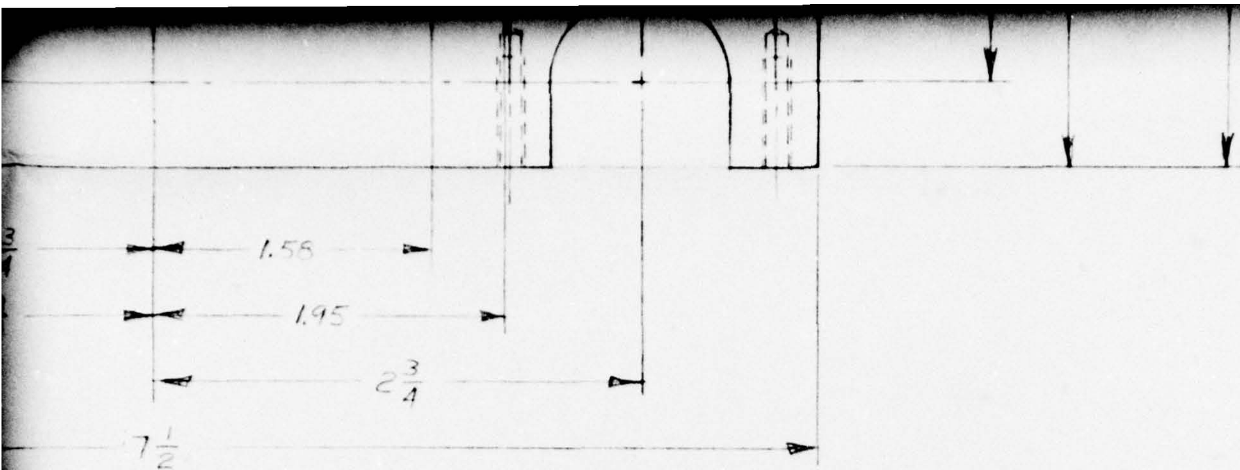
(11) OUTPUT MOUNT PLATE

ALUM ~ 1 REQD



(14) TOP CLAMP

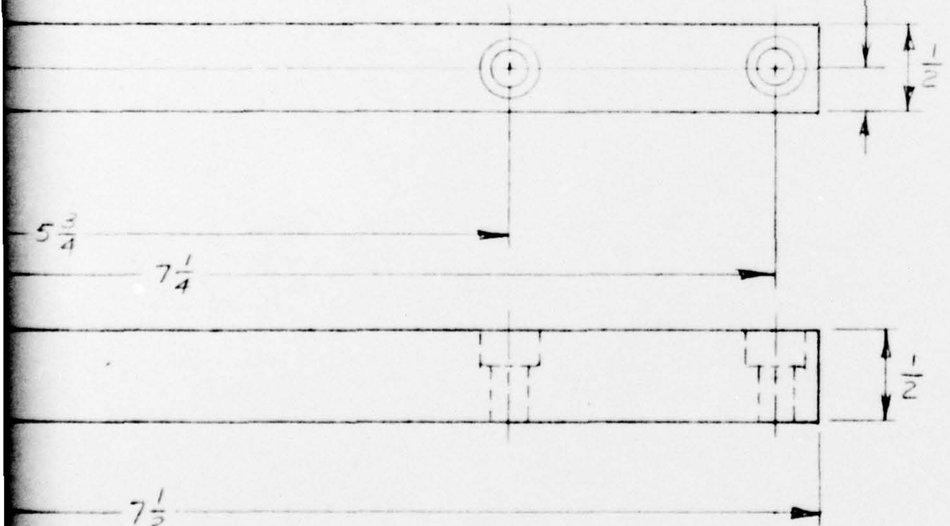
ALUM ~ 2 REQD



OUTPUT MOUNT PLATE

ALUM ~ 1 REQD

DRILL CL HOLE FOR 8-32 SCR
BORE × $\frac{3}{16}$ DEEP, 4 HOLES

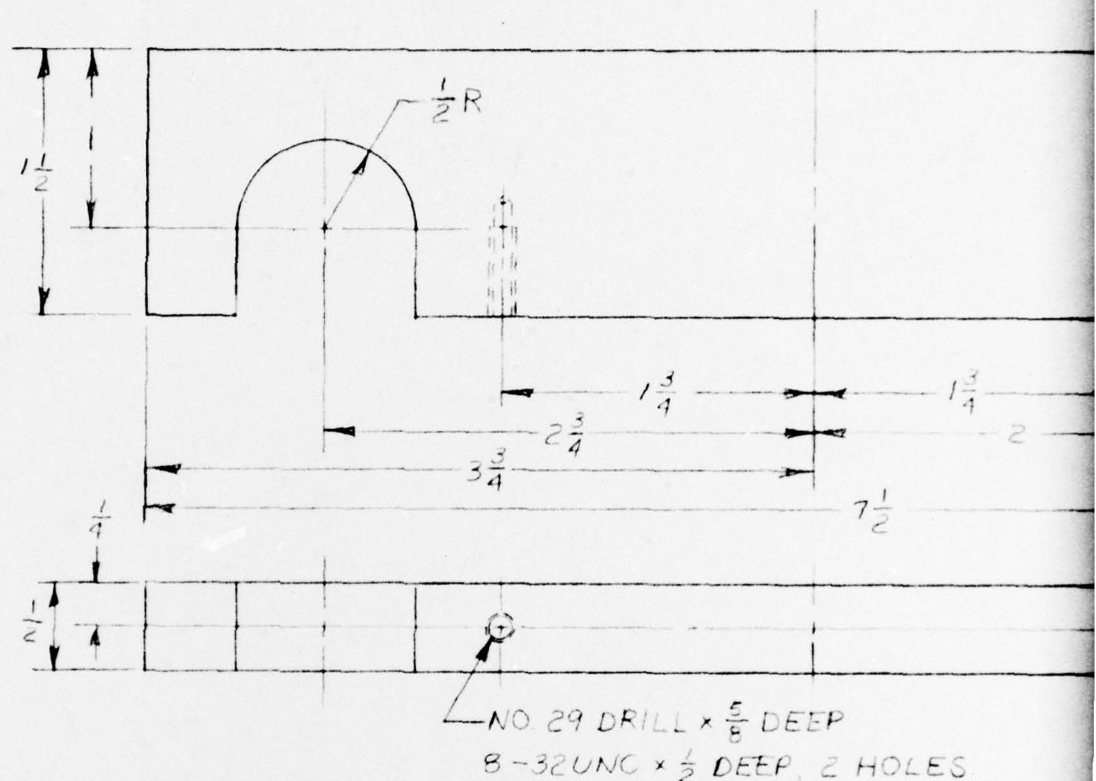


TOP CLAMP

M ~ 2 REQD

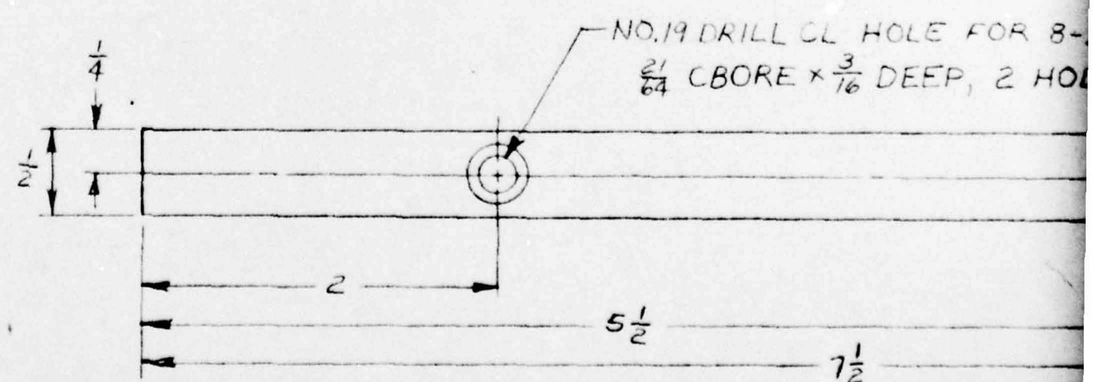
(13) BOTTOM OUTPUT CLA

ALUM ~ 1 REQD



(15) MOUNT

ALUM ~ 8 REQD

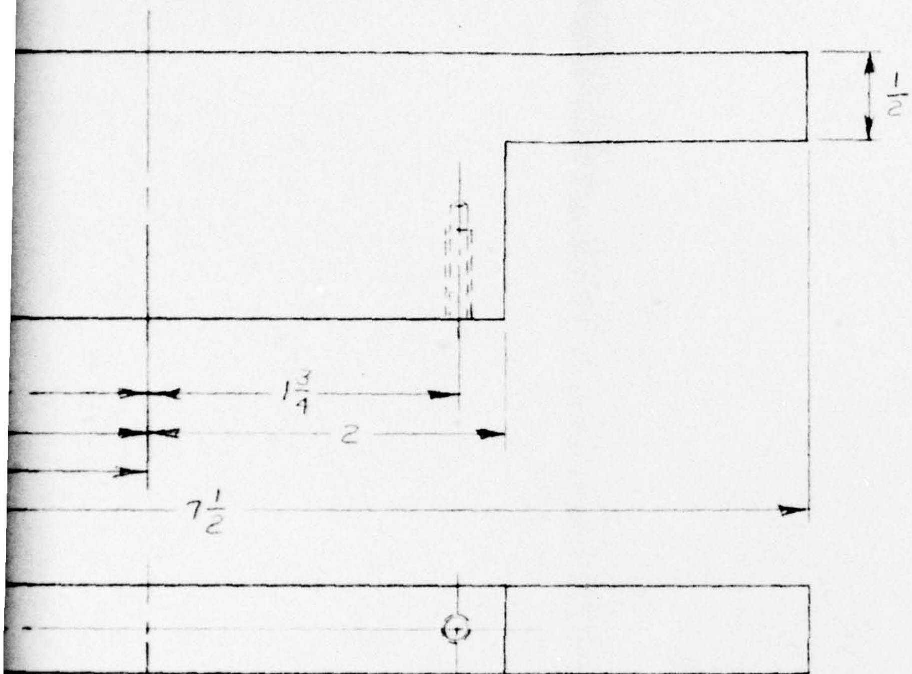


(16) CLAMP

ALUM ~ 8 REQD

) BOTTOM OUTPUT CLAMP

ALUM ~ 1 REQD



L × $\frac{5}{8}$ DEEP

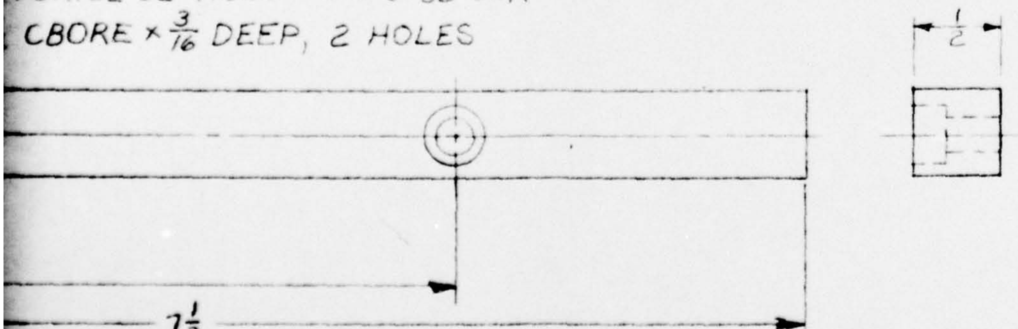
$\frac{1}{2}$ DEEP, 2 HOLES

(15) MOUNT

ALUM ~ 8 REQD

9 DRILL CL HOLE FOR 8-32 SCR

CBORE × $\frac{3}{16}$ DEEP, 2 HOLES



(16) CLAMP

ALUM ~ 8 REQD

25	3	1	SPRIN
24	3	3	SOC H
23	3	4	SOC H
22	3	8	SOC H
21	3	36	SOC H
20	3	2	NUT
19	3	4	ROD
18	3	1	MICR
17	2	2	FAFNI
16	3	8	CLAM
15	3	8	MOUN
14	3	2	TOP
13	3	1	BOTT
12	3	1	BOTT
11	3	1	OUTP
10	2	1	MOUN
9	2	1	TABL
8	2	1	GRAT
7	2	1	GRAT
6	2	2	SHIE
5	2	2	WASH
4	2	1	SHAF
3	2	1	ARM
2	2	1	BAS
1	2	1	GRA
PART	SHEET	REQD	D

25	3	1	SPRING	——	——
24	3	3	SOC HD CAP SCR	4-40UNC-3A × $\frac{3}{4}$	STN STL
23	3	4	SOC HD CAP SCR	4-40UNC-3A × $\frac{1}{4}$	STN STL
22	3	8	SOC HD CAP SCR	6-32 UNC-3A × $\frac{1}{2}$	STN STL
21	3	36	SOC HD CAP SCR	8-32 UNC-3A × $\frac{3}{4}$	STN STL
20	3	2	NUT	$\frac{3}{8}$-16UNC-3B	STN STL
19	3	4	ROD	1" DIA.	——
18	3	1	MICROMETER	STARRETT T465	——
17	2	2	FAFNIR 7201 BEARING	1.2598 OD, .3937 W, .4724 BORE	
16	3	8	CLAMP	$7\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$	ALUM
15	3	8	MOUNT	$7\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$	ALUM
14	3	2	TOP CLAMP	$7\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$	ALUM
13	3	1	BOTTOM OUTPUT CLAMP	$7\frac{1}{2} \times 1 \times \frac{1}{2}$	ALUM
12	3	1	BOTTOM GRATING CLAMP	$7\frac{1}{2} \times 1 \times \frac{1}{2}$	ALUM
11	3	1	OUTPUT MOUNT PLATE	$7\frac{1}{2} \times 7\frac{1}{2} \times \frac{1}{2}$	ALUM
10	2	1	MOUNT	$1\frac{3}{4} \times 1\frac{7}{8} \times \frac{1}{2}$	ALUM
9	2	1	TABLE MOUNT	$2\frac{3}{4} \times 2 \times \frac{1}{4}$	ALUM
8	2	1	GRATING TABLE - RIGHT	$2 \times \frac{3}{4} \times \frac{5}{8}$	ALUM
7	2	1	GRATING TABLE - LEFT	$2 \times \frac{3}{4} \times \frac{5}{8}$	ALUM
6	2	2	SHIELD	$\frac{1}{8} \times 1\frac{1}{4}$ DIA	FELT
5	2	2	WASHER	$\frac{1}{4} \times 1\frac{1}{4}$ DIA	ALUM
4	2	1	SHAFT	$5 \times \frac{3}{4}$ DIA	STN STL
3	2	1	ARM	$3\frac{7}{8} \times 1\frac{1}{4} \times \frac{5}{8}$	ALUM
2	2	1	BASE	$3\frac{1}{4} \times 3\frac{1}{4} \times 2$	ALUM
1	2	1	GRATING MOUNT PLATE	$9 \times 7\frac{1}{2} \times \frac{1}{2}$	ALUM
PART	SHEET	REQD	DESCRIPTION	SIZE	MATERIAL

THE OHIO STATE UNIVERSITY
ELECTROSCIENCE LABORATORY

DATE 7-15-76	GRATING TABLE	SHEET 3 OF 3
SCALE FULL		PROJECT 4430
DRAWN J GIBSON		D-429
CHECKED		
APPROVED		